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PREGNANCY IN RUDIMENTARY HORN OF THE UTERUS : WITH REPORT OF EIGHT CASES

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INTRODUCTION

In 1842, Rokitansky described what he thought was the first case of pregnancy in rudimentary horn of the uterus and Scanzoni in 1852 described what he thought was the second case; but Kussmaul drew attention to the earlier cases in his classical work of 1859. He described twelve cases, the first being that of Dionis, in 1681. It was the case of a lady attached to the court of Maria Theresa who ordered Dionis to perform an autopsy and made him show her the specimen. It represented a right-sided normal uterus and a ruptured rudimentary left horn containing the gestation sac. Sanger in 1884 collected and described twenty-nine cases of this variety.

It is interesting to note that the term 'extra-uterine pregnancy' was the earliest one introduced to describe all the pregnancies outside the uterus. In 1873, Robert Barnes first introduced the term 'ectopic' to denote pregnancy occurring in the interstitial portion of the Fallopian tube and in the rudimentary horn. He argued that these two were inherent parts of the uterus and hence pregnancy occurring at these sites could not be called 'extra-uterine'.

The maldeveloped horn may be so small as to be overlooked. Duff recorded a case in 1914 of rupture of ectopic gestation in which at the operation it was considered to be a tubal pregnancy, but a careful inspection at autopsy proved it to be a small rudimentary horn. In such cases, rupture occurs within a few weeks after conception. In most cases, however, there is a fair degree of development of the rudimentary horn. When the horn is very small it is attached to the normally developed side by a pedicle which is generally solid and not canalised. In other cases, where the rudimentary horn is closely connected with the normal side, it is found that there is absence of any communication with the cavity of the normally developed side. There have been cases in which a canal has been proved to exist communicating with the cervix and the vagina. In this variety of maldevelopment the Fallopian tube is small but canalised and the ovary is usually normally developed.

Virchow in 1860 pointed out that the relation of the round ligament to the gestation sac formed a ready means of distinction between a gravid Fallopian tube and pregnancy in a rudimentary horn. In tubal gestation the round ligament is attached to the body of the uterus on the uterine side of the gestation sac, while in pregnancy in a rudimentary horn the round ligament is situated on the outer side of the sac (*vide* Case 1).

MODE OF FERTILISATION

Absence of any communication between the cavity of the rudimentary horn and the cervix or vagina of the normally developed side brings into prominence the mode of fertilisation. When corpus luteum of pregnancy is detected in the ovary belonging to the rudimentary horn the spermatozoa travelling by way of the Fallopian tube of the normally developed horn enter the peritoneal cavity and reaching across the pouch of Douglas fertilise an ovum discharged from the ovary belonging to the rudimentary horn. In those cases where the corpus luteum of pregnancy is detected in the ovary belonging to the rudimentary horn the spermatozoa travelling by way of the Fallopian tube of the normally developed horn enter the peritoneal cavity and reaching across the pouch of Douglas fertilise an ovum discharged from the ovary belonging to the redimentary horn. In those cases where the corpus luteum is detected in the ovary belonging to the normally developed horn it is likely that the fertilised ovum reaches the Fallopian tube on the opposite side by 'external migration'. Barnes, many years ago, suggested that instead of this 'vagrant circuitous route' it was likely that the passage from the developed uterus through the rudimentary horn was patent permitting the fertilisation in the usual way and that the obliteration of the opening took place during the development of the sac.

CLINICAL COURSE

The usual termination of this variety of conception is rupture. The duration of gestation before rupture occurs depends on the degree of the development of the rudimentary horn. Generally, there is sufficient fibromuscular development of the wall of the rudimentary horn to allow pregnancy to continue till 16 to 20 weeks before rupture. In some cases, where the horn is very small and poorly developed, rupture occurs in early weeks as in the case recorded by Duff. Munro Kerr states that the incidence of rupture according to Kehrer is 47%, and according to Werth 45%. Decidua develops in the normal horn and is discharged per vaginum immediately preceding rupture or sometimes after rupture has taken place. In two of the cases recorded below a complete decidual cast was expelled per vaginum before rupture of the gestation sac in the rudimentary horn. Cases have been recorded where pregnancy has continued till full term followed by ineffectual labour and the death of the foetus. If the gestation sac does not get infected mummification or the development of lithopedion may take place. If infection of the gestation sac supervenes peritonitis occurs with dense adhesions surrounding the rudimentary horn. Torsion of the pedicle of the rudimentary horn with clinical features suggestive of twisted ovarian cyst has been recorded. Another complication is prolapse of the pregnant rudimentary horn in the pouch of Douglas.

Clinical Features

As long as normal development occurs there are no abnormal symptoms and the condition remains undetected. When a patient visits the antenatal department in early weeks, a vaginal examination to confirm or exclude conception may lead to an erroneous diagnosis. In such a case, the normally developed horn is palpated as a normal-sized, non-pregnant uterus and a firm globular mass due to the pregnant rudimentary horn is diagnosed as a fibromyoma or an ovarian cyst. With suggestive history of conception and the above findings, an x-ray with or without lipiodol is helpful in arriving at a diagnosis. Diagnosis at this stage is likely to be made only when the possibility of this unusual condition is borne in mind. Malformations of the vagina as partial septum may also assist in directing the attention to this condition.

When rupture occurs the clinical picture is like that of the 'fulminating' type of rupture of a tubal gestation. As there is severe intraperitoneal bleeding the shock is much greater in this condition.

Differential Diagnosis

(1) *Threatened miscarriage*—Vaginal bleeding due to separation of the decidual cast is likely to cause confusion. In one of the cases recorded below this diagnosis was made by the resident accoucheur.

(2) *Twisted ovarian cyst*—This diagnosis is sometimes made particularly when torsion of the gravid rudimentary horn has occurred or when it has prolapsed in the pouch of Douglas.

(3) *Spontaneous rupture of a normal pregnant uterus*—This condition is noted for its rare occurrence but a case has been reported by Snidow of a second para with previous normal pregnancy having been seen by him at the antenatal clinic and, as in our case, having been diagnosed as threatened miscarriage but having refused admission, developed all signs of rupture ten hours later. He also mentions that valuable time was lost because not much importance was attached to the fact that there was excessive tenderness in the lower abdomen.

(4) *Secondary abdominal pregnancy*—When pregnancy in the rudimentary horn goes to full term and is followed by 'spurious' labour with death of the foetus it is likely to be retained for a varying period. Previous history of vaginal bleeding due to the separation of the decidual cast is likely to be mistaken as an evidence of primary tubal rupture and the presence of an abdominal tumour showing x-ray evidence of lithopedion is diagnosed as an evidence of secondary abdominal pregnancy.

Case Reports

Case 1—A primipara aged 16 was admitted on 6-8-41 at 12-30 p.m. with the history of pain in the lower abdomen since the previous afternoon and bleeding per vaginum since the previous evening. The pain was in the middle line and on both the sides. It was of a constant aching character. The bleeding was fair in amount and the blood was not dark in colour. No clots or any pieces of tissue had been passed. She had not been able to pass urine since the morning of the day of admission, and her bowels had not moved since the previous day.

She had amenorrhoea of 3½ months' duration. During this period there had been no attacks of pain in the lower abdomen. There had been no bleeding per vaginum till the evening of 5-8-41. She had never had any feeling of nausea, giddiness or faintness, but she used to vomit occasionally during the first two months.

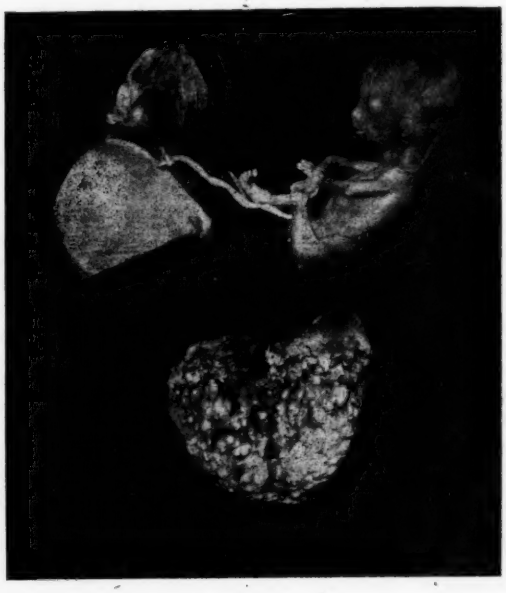
The previous history is suggestive. Five years ago she had married. She had started her periods years ago. From the beginning they were scanty and irregular, coming on every 1½ to 2 months. In addition, there was severe spasmodic dysmenorrhoea during the first two days of each period. The pain was all over the lower abdomen and also in the back. She could not definitely say whether the pain was more on the left side.

On admission, the general condition of the patient was quite good. Her pulse was 88 per minute, respiration 22, and temperature 98·2°F. Her blood pressure was 110/70 mm. of Hg.

After catheterisation the patient was examined by the resident accoucheur. On abdominal palpation the uterus was just palpable and rather tender. There was no rigidity, tenderness or free fluid in the abdomen. Vaginal palpation showed the uterus enlarged to 2½ months' size. The cervix was two fingers dilated. A large, soft piece of tissue was felt lying loose within the cervical canal. This was removed with the fingers and was found later to be a decidual cast. The left fornix was tender. No definite lump could be felt. The right fornix seemed clear. At this stage diagnosis of incomplete abortion was made.

Two hours after admission the patient became very restless, her skin was cold and clammy and the pulse rate was 138 per minute with a poor volume. She complained of severe pain in the abdomen, especially over the lower part, but could not say definitely whether it was more marked on one side or the other.

A second vaginal examination was done by me and the cervix was found to be two fingers dilated. The uterus was deviated to the right side and was slightly larger than the



Case 1

normal. There was an indefinite mass in the left fornix. It was evident that there was internal hæmorrhage and a diagnosis of extra-uterine pregnancy was made. It was decided to operate upon the patient without delay.

The abdomen was opened under general anæsthesia by a midline subumbilical incision. On opening the peritoneum a large quantity of dark blood welled out. It was all collected, citrated, strained and given back to her intravenously. After packing the intestine it was found that one cornu of the uterus was greatly expanded and on further inspection it was evident that this was a case of gestation in the rudimentary horn of the uterus. The normally developed side was displaced to the right. There was a placental tissue projecting from the ruptured horn. No fœtus could be seen. It was later found lying free in the pouch of Douglas. The rudimentary horn was removed by putting two clamps on its pedicle. The Fallopian tube and the round ligament were clamped and cut, and the rudimentary horn was removed. The ovary was left behind. The normally developed horn was suspended in a forward position by plicating the round ligament on the right side. The cut end of the left round ligament was fixed to the front of the uterus. After removing the remaining blood, blood clots and a four months' fœtus lying free in the pouch of Douglas, the abdomen was closed in layers. She had an uneventful recovery.

Case 2—A fourth para, aged 30, was admitted on 29-7-42 at 4-40 p.m. with the history of four months' amenorrhoea and severe pain in the abdomen since 9 a.m. There was no bleeding per vaginum either before or on admission.

On admission, the patient was in a state of shock. She was cold and clammy. Her pulse rate was 120 per minute, temperature was 97° and respiration 26 per minute.

On abdominal examination, the lower abdomen was found to be slightly distended, rigid and tender. Tenderness was more marked on the side. An indefinite mass was also palpated on the left side of the lower abdomen. Shifting dullness was also present. On vaginal examination, the cervix was found to be soft. The uterus was anteverted and anteflexed, of normal size and deviated to the right side. The left and posterior fornices were tender. It was evident that there was internal hæmorrhage and a diagnosis of extra-uterine pregnancy was made. It was decided to operate immediately.

Case 2

The abdomen was opened under local anæsthesia by a midline subumbilical incision. On opening the peritoneum, the abdominal cavity was found to be full of blood. About 500 c.c. of blood was removed, citrated, strained and given back to the patient intravenously. On further examination it was evident that it was a case of rupture of a left rudimentary horn. The umbilical cord and the placenta were still attached to the rudimentary horn. The fœtus was found lying free in the abdominal cavity. The rudimentary horn was removed in the same way as described in Case 1. The abdomen was closed in layers. She had an uneventful recovery.

Case 3—A third para, aged 25, was admitted on 19-10-43 at 9 a.m. with the history of three months' amenorrhoea and severe pain in the lower abdomen since the early morning. There was no vaginal bleeding either before or on admission.

On admission her general condition was not satisfactory. She had cold extremities, pale mucous membranes, and her pulse rate was 92 per minute and was of poor volume.

On abdominal examination, a midline swelling was palpated rising upto two fingers below the umbilicus. There was no tenderness on abdominal palpation. On vaginal examination the cervix was found to be soft and the external os was closed. The uterus was retroverted and deviated to the right side. A swelling was found filling the left fornix which was continuous with a mass palpated per abdomen. There was fullness in the pouch of Douglas. A diagnosis of extra-uterine pregnancy with a left broad ligament hæmatoma was made.

The abdomen was opened under local anaesthesia by a midline subumbilical incision. On opening the peritoneal cavity, free blood was found. It was collected, citrated, strained and given back intravenously. On examination it was found that it was a case of pregnancy in the left rudimentary horn which had ruptured. The fœtus covered with membranes was lying free in the peritoneal cavity, while the placenta was partially detached and partially attached to the rudimentary horn. The rudimentary horn was removed as described in Case 1. The abdomen was closed in layers. She had an uneventful recovery.

Case 4—A primipara aged 19 was admitted on 24-10-44 at 12-5 p.m. with the history of severe generalised pain in the abdomen from 4 a.m. She had vomited twice; there was no bleeding per vaginum.

She had amenorrhœa of 4½ months' duration. Her previous menstrual cycles had been regular with moderate flow. During the period of amenorrhœa she had no attacks of pain in the abdomen.

On admission her pulse was 120 per minute and temperature 97°F with slight restlessness.

Abdominal examination showed marked tenderness all over with slight rigidity. Tenderness was more marked in right iliac and right lumbar regions. An irregular mass, markedly tender, was felt in the hypogastric region and it was of the size of a five months' gravid uterus. Shifting dullness was also found.

Vaginal examination could not be carried out due to tenderness. At 12-30 p.m. vaginal examination was done under general anæsthesia. A mass, the size of a 4½ months' gravid uterus, was felt in the middle line, but its shape was irregular and its mobility restricted. To its left another mass was found of the shape of a bulky uterus.

Speculum examination showed cervix slightly shifted to the left. A sound was passed and it was directed to the left for a distance of 5 inches.

Examination of blood: R.B.C. 2·52 million, Hb.—47%, W.B.C.—19,600.

At 1-30 p.m. the pulse rate rose to 140 per minute and the patient was more restless. B.P. 65/40 mm. of Hg.

Subcutaneous saline, 400 c.c., and glucose, 150 c.c., intravenously were given. Blood transfusion was started at 1-45 p.m.

Laparotomy was perofromed under genera anæsthesia. Peritoneal cavity was found to be full of blood and blood clots. After collecting the liquid blood in citrate, the peritoneal cavity was further opened. There was a pregnancy in a rudimentary horn on the right side that had ruptured intraperitoneally with placenta and cord still attached to the horn, but the fœtus was in the peritoneal cavity. The round ligament of the right side was noted to start at the lateral border of the ruptured ectopic gestation. Excision of the horn with right salpingectomy was performed. During operation 600 c.c. of blood was given from a donor as well as the liquid blood collected in the citrate solution. The patient had an uneventful recovery.

Case 5—(Cama Hospital Case.)—C.S. (Reg. No. 4124A), aged 21, married 11 months, admitted on 7-2-41 at 11 a.m. for (1) retention of urine for one day, (2) pain in the epigastrium and vomiting immediately after food for 5 days, (3) constipation for 8 days, and (4) amenorrhœa of 5 months' duration.

Condition on admission. The patient looked rather pale, her temperature was 98·6°F, pulse 90 p.m.; on being catheterized 4 oz. of urine were drawn out. There was generalized fullness of the abdomen, with tenderness in the lower abdomen, without any rigidity. A midline swelling, the size of a 5 months' pregnant uterus, was present. Fœtal parts were palpable but no fœtal heart sounds were heard. Bimanual vaginal examination was done, os was tightly closed. There was no bleeding. B.P. 90/65 m.m. of Hg.

Progress. A simple enema was given on admission and again repeated the same evening with poor result. Her condition remained the same the whole day. In the evening she passed 6 oz. of urine by herself though the bowels were still not opened. At 10 p.m. the patient was getting restless and the distension was also seen to be increasing. Turpentine stupes were given 4-hourly. Injection of morphia ¼ grain with atropine sulphate grain 1/100 was given at 11-45 p.m. and the patient slept well till 4 a.m., when she awoke. She became again restless. Turpentine enema was given with poor result. At this time she had retching and small vomits twice. Temperature 98°F, pulse 90 p.m. Just after the turpentine enema she passed a small membranous piece of tissue per vaginum which looked like a piece of chorion.

She was kept under observation the whole morning, at the end of which the abdomen was very much distended. It was resonant in the upper half and flanks, and had a dull impaired note in the subumbilical region. A complete blood count was done by the pathologist: the red cell count was 1·32 million; Hb, 35% and white cell count was 6,000. With these findings the whole picture had to be looked upon in a different light. The bit of tissue she had passed was carefully examined and was seen to be a complete decidual cast, with one tubal orifice at one angle, the opposite side appeared flattened and no opening was found at any other place except the cervical canal.

A bimanual vaginal examination was done: cervix was found to be far back, hard and small, the uterus could not be defined; marked fullness in the anterior fornix. Ectopic gestation with rupture was diagnosed and immediate laparotomy was decided upon. In view of the fact that the pregnancy had advanced 5 months, two conditions were thought of. One, a secondary rupture of an old tubal pregnancy and two, pregnancy in a rudimentary horn. There was no history suggestive of a rupture earlier, so the most probable diagnosis was a ruptured pregnant rudimentary horn.

The husband's blood was matched and found compatible.

Laparotomy was done under spinal anæsthesia. Large blood clots were seen on opening the peritoneum, which being removed a fœtus of 5 months' size presented itself, enclosed in its intact amniotic sac and covered over by a few omental adhesions. The sac was ruptured; two-thirds of the placenta was also lying loose in the general peritoneal cavity, the remaining one-third was attached to the cavity of a well-contracted uterus which was turned inside out, and lay in the left half of the pelvis. This was attached at its medial end, by a thick band about an inch long and ¾ inch thick, to the upper part of the uterus just below the fundus. The round ligament, tube and ovary were situated at its outer end. On the right side a full-sized uterus and normally developed appendages were present. The pedicle and the outer end of the broad ligament being clamped, the whole thing could be excised without much difficulty. The left tube was removed, but the ovary left intact. The corpus luteum of pregnancy could not be localized. The stump was carefully ligated and the abdomen was closed in layers. The convalescence was uneventful. The patient has been attending the out-patient's department and is about 8 months' pregnant.

Case 6 (Cama Hospital Case.)—M.R., aged 21, was admitted on 17-12-41 at 8-30 p.m. for pain in the adbodmen since 7 days, worse since 3 days, following amenorrhœa of about 3 months.

Condition on admission. The patient was in a collapsed condition, looked very pale, her extremities were all cold and clammy, pulse could barely be felt and could not be counted.

Previous O.H.—5 F.T.N.D. last five years ago. M.H. 4-5/30, regular and painless.

On examination it was found that her abdomen was doughy and tender all over. It was hyperresonant anteriorly and dull in the flanks.

A diagnosis of ruptured ectopic gestation was made and resuscitative measures carried out (*viz.*, injection of morphia, submammary saline and stimulant drugs).

Her husband's blood was matched and found compatible.

The blood count was done and found to be: R.B.C. 1·96 million, Hb 35%, W.B.C.—total—10,300; differential—poly 82%, lymphocytes 17%, monocytes 1%.

The next morning her condition was much better and her pulse was 146 per minute.

Laparotomy was done under local anæsthesia and a few whiffs of ether. The peritoneal cavity was found to be full of blood very little of which had clotted. The placenta was lying free and a fœtus about 4 months' size was attached to it. 1,000 c.c. of blood was removed and it was found that the ectopic gestation had taken place in an underdeveloped right uterine horn which had become everted. Appendages being normal both sides were left intact. The underdeveloped cornu had a broad attachment to the normally developed uterine half and this was not canalized. 150 c.c. of the husband's blood and 200 c.c. of filtered intraperitoneal blood was transfused into the patient's vein during the operation.

Blood transfusion consisting of 100 c.c. of the husband's blood and 100 c.c. of the intraperitoneal blood was repeated the same evening. The patient had a rigor following this but had an otherwise uneventful recovery.

Case 7 (Cama Hospital Case)—In this case a midline swelling about the size of a 4½ months' pregnant uterus was felt though the patient was admitted with amenorrhœa for 6½ months and spasmodic pain in the abdomen for 1 month. A diagnosis of missed abortion was made and the patient kept under observation. The pain continued and was rather severe one day; a very careful bimanual examination being done ectopic pregnancy was suspected as the swelling was deviated to one side while a suggestion of the normal uterine body was felt on the opposite side. At operation a pergnant uterine horn was seen—very much eroded on its superior surface—it was excised with its tube and ovary.

Case 8 (Bai Motlibai and Petit Hospitals)—J. M., aged 27, married 8 months, was admitted on 18-1-44 for occasional pain in the right side of the abdomen and backache for one month. She had a swelling in the right iliac fossa and 4 months' amenorrhœa. Her periods were previously regular 3-4/30 type, no dysmenorrhœa. Last menstruation 21-9-43. Occasional nausea 1½ months later. No swelling of breasts noted.

On examination she was found to be fat, but otherwise her general condition was good. Breasts—no secretion.

Abdominal examination revealed a round swelling rising out of pelvic and felt in the right iliac fossa, extending 4 inches above the symphysis and 1 inch to the left of the middle line. It was dull on percussion, firm, mobile, and slightly tender.

Per vaginum. The cervix pointed downwards and forwards, not softened. Firm round swelling felt in the right fornix and pouch of Douglas separate from the uterus and continuous with the abdominal swelling.

Blood examination: Hb.—85%, R.B.C.—4 million, W.B.C.—7,000, 85% polymorphs, 41% lymphocytes. The swelling was diagnosed as an ovarian cyst, the amenorrhœa being put down to an endocrine cause in view of the patient's normal sized uterus and her fat condition.

Operation under spinal anæsthesia on 19-1-44. The lump was found to be a pregnancy in the interstitial portion of a rudimentary uterine horn. The round ligament, ovarian ligament and tube of the right side were all attached to the swelling, but at points almost equidistant from each other and from the very ill-developed fibrous band connecting the tumour with the other half of the uterus about the level of the internal os. (The more usual condition, of course, is for the tube, round ligament and ovarian ligament to be attached near each other and at the outer end of the rudimentary horn.) The left-half uterus was small with the left tube and the round ligament attached to the top of it. The corpus luteum was in the right ovary.

The tumour was removed leaving both the tubes and ovaries. A 3½ to 4 months' foetus was found in the gestation-sac the walls of which were thick and muscular. Convalescence was normal.

Discussion

1. The period of amenorrhœa in the eight cases was as follows: Case 1, 3½ months; case 2, 4 months; case 3, 3 months; case 4, 4½ months; case 5, 5 months; case 6, 3 months; case 7, 6½ months; and case 8, 4 months. These are in agreement with the usual statement that rupture in pregnancy in a rudimentary horn generally occurs between 16 and 24 weeks.
2. Case 1 presented herself before rupture of the thinned-out rudimentary horn, and rupture after admission was probably due to manipulations. The passage of decidual cast misled the resident accoucheur to diagnose the case as 'incomplete abortion'.
3. Diagnosis in all the eight cases was 'ruptured ectopic gestation' and only in case 5 the possibility of rupture of a gravid rudimentary horn was considered pre-operatively.
4. Intraperitoneal bleeding is generally very marked in these cases due to the tearing of large-sized blood vessels. In five cases considerable amount of liquid blood was collected, citrated, strained and given back to the patient intravenously.
5. In the eight cases 'rudimentary horn' was present on the left side in four cases, on the right side in three cases, and there was no mention of the side in the remaining case.
6. There is no impairment of menstrual or reproductive function of the normally developed horn. Previous normal pregnancies had occurred in three cases; case 2 was a fourth para; case 3 was a third para; and case 6 was a sixth para. In case 5 a subsequent pregnancy had occurred. Cases 1, 4 and 8 were primiparæ, while there is no mention of parity in case 7.
7. There was no death in the eight cases reported and this was probably due to the instantaneous replacement of the lost blood by 'autohæmofusion' and blood transfusion. In spite of the reported disadvantages 'autohæmofusion' is very useful in the cases.

The first four of the eight cases reported in this paper have been treated in the Nowrosji Wadia Maternity Hospital, the next three in the Cama Hospital, and the last one in the Bai Motlibai and Petit Hospitals, Bombay. The three cases treated in the Cama Hospital have been reported by S. Ambekar, M.D. (BOM.), in a paper read before the Association of Medical Women in India, Bombay, December 1941, and the one case from the Bai Motlibai and Petit Hospitals has been reported by Major H. Waters, I.M.S., in the *Indian Medical Gazette*.

The object of submitting the reported four cases again is to have all cases of this type in one group.

Acknowledgment

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POPULATION PROBLEMS AND INDIA

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Poona.

Introduction

Mr. Blacklock in his article on the 'Population Problem of India' which appeared in the *British Medical Journal* in December, 1943, has boldly made certain assumptions in predicting the future trend of population movements in India. The funniest part of it is, that he depends upon the 'seemingly trustworthy' utterances of some unreliable politicians. It is, therefore, intended here to give as brief a general review as possible, of the present stage of our knowledge of the population problems with particular reference to India, so that the readers will be able to judge for themselves, how any bold assumptions and sweeping generalisations from them are not only ridiculous but at the same time may prove very dangerous to the best interest of the society in question.

Theory of Malthus

It has become practically ceremonious to start any discussion on the population problems with first reference to the Malthus' 'law of population'. This so-called law of population was embodied in one essay on the 'principle of population as it affects the future improvement of society' published by the gloomy parson, in the year 1798. His thesis was that the population constantly tends to outrun the means of subsistence, and he stated these tendencies in a mathematical form, of geometric and arithmetic ratio. The enthusiastic reception that was accorded to this essay in that century, which was neither based on observation of facts, nor logic, was simply due to the temper of the time. The wealthier and well-to-do classes wanted a defence against socialistic teachings of the day. The essay practically evolved a conclusion that the then existing poverty was due to overpopulation at the time, and the social order had nothing to do with it. To quote Prof. Edward B. Reuter[1] "the popular success of that theory was thus due more to the interest that it defended, or seemed to defend, than to any profound scientific truth that it enunciates." This state of affairs, completely changed after the English birth-rate began to fall down after 1878, when a general reaction to this theory followed. It is quite a common knowledge with the biologist that the plants and animals on which man feeds tend to increase faster than man. Dr. Cannan[2] simply describes this theory as a 'Chaos of facts collected to illustrate the effect of laws which do not exist." Prof. Fetter[3] remarks, "the famous proposition of Malthus concerning population is always fallacious, and always confusing in social inquiry and ought, therefore, to be laid away finally in the collection of outgrown illusions." (*American Journal of Sociology*).

Growth and Decline of Population

But one important consequence of this pseudo-scientific theory of population, was to evoke a good deal of discussion and study about the growth and decline of populations. Ample theories since then, have come into existence, right from the cosmic theory which states that the growth and decline of populations, is cyclical, a period of growth alternating with the period of decline, upto the recent dynamical conception of population embodied in a fine mathematical technique by Dr. R. R. Kuczynski. In different theories different social, economic, and biological factors have been taken into consideration with a particular emphasis on one or the other of them. Nitte[4] for example, states that in a democratic social situation, every man tends to raise his social position, is prepared to make any sacrifices for the same, with a consequent fall in birth rates and wherever there are rigid class distinctions or in his terms, this law of "social capillarity" is not operative, the birth rates are high. According to him, a rise in a standard of living, extension of luxuries and comforts, increase in wealth, result in decrease of fecundity. Dr. Cannan has put forward an "optimum theory," that optimum being, the maximum under given conditions of arts of production and the free interplay of natural resources. Dr. Raymond Pearl[5] has advanced the view that "the populations grow and decline according to a biological law and largely irrespective of social and economic factors." In reply to this theory, no better authority than Prof. J. B. S. Haldane can be quoted, who, in his speech in the World Population Conference in 1927, has rightly remarked, "I think, if the great war and the Russian Revolution do not seriously upset the growth of population, it is very difficult to imagine what will." It will be seen from the above discussion that though there are numerous theories advanced, the evaluation of different factors like social, economic, cultural, psychological, political, biological, etc. which are responsible to the growth or decline of populations, is still to be achieved and the ultimate trend of any population, as determined by the aggregate effect of all these environmental factors put together, reacting on the vital capacities of the population, cannot be estimated even with a reasonable amount of certainty.

However, the study of populations is largely centred around the study of births and deaths. It is a usual knowledge that the birth-rates are not only various in various species of living forms, but are not the same even in one species like "Homosapians," the lower the organism in the nature's scale, the higher is the rate of reproduction. To take an example, an average size female of an oyster lays about 16 million eggs per season. Simple mathematical calculation would bring us to a conclusion that in the fifth generation, the descendants of a single female would make a mass eight times as large as the earth. The elephant, one of slowest breeding animals, has the physiological capacity to produce a progeny, so numerous that in a few centuries the earth would not furnish them with even a standing room. It would be, therefore, evident that the potential of capacity of any species to reproduce is high enough to occupy the earth within a comparatively short time, and if this were a reality, it would have been impossible for a man even to survive. The physiological capacity of a human being also is such that one single pair at the time of Christ would today be sufficiently numerous, so that only one-eleventh of them could be provided with a standing room on the entire surface of the earth.

But this potential enormous physiological capacity of any species is never manifested in reality. To quote the example of the American population in early decades, it is remarkable to find that even in a physical environment that placed a minimum of restriction on growth and a public sentiment strongly favouring early marriage and an unrestricted birth-rate, the actual birth-rate only approached the capacity of the species. Further, even in the same species of Homosapiens, the reproduction capacities not only vary from one society to another and in different groups of the same society, but also from individual to individual. Though the natural control of limitations of space operate equally in man and animals, still there are many additional factors in the human realm like

social, economic, cultural, etc., which are not in the least less important than the natural, and of which we have at present no exact knowledge. During the 19th century the population of the world increased by about 100%. Since the period in which some reliable statistical data are available, the population of all the European countries has rapidly increased. The following figures of some countries will help to give some idea :—

	Country	*Year*	*Population*	*Year*	*Population*
1.	United Kingdom ..	1801	16·3	1901	41·5
2.	European Russia ..	1801	40·1	1901	112·8
3.	Germany ..	1801	25·0	1900	56·4

(The figures are in millions and approximate)

It is worthwhile noting at this stage that even though the population was rapidly increasing in these European countries, still there has been a very remarkable increase in the production of food-resources of human subsistence. The application of scientific knowledge to agriculture and development of industries has made it possible to support, more than double the numbers at the end of the 19th century without any fear of overpopulation. The statement of Malthus in the light of this fact at the end of the 18th century, trying to explain the then existing poverty on the grounds of overpopulation looks rather misleading.

The behaviour of birth-rates in Europe in the recent past has however caused a good deal of discussion and even anxiety in certain quarters. Birth-rates have been steadily declining all over and some writers have even expressed this phenomenon as an index of decadent civilisation. But the cause accepted by many for the decline, is the conscious control and desire to limit the size of the family. The rise in the standard of living, increased desires of personal success and ambitions at the cost of anything else, change in the ideas and ideals of women with consequent opportunities for their individual personalities outside the sphere of a family, growing economic burden to maintain the so-called decent existence, widespread knowledge of the means of birth control, are some of the important factors contributing towards this decline. Whatever it is, with the set of social and economic circumstances in the western civilisation the birth rates are falling. The fact has definitely made many minds think over the problem and in some countries in Europe like Germany, France, Italy and Belgium the Governments have taken a great initiative to stop the decline. Mr. D. V. Glass[6], in his "Population Policies and Movements in Europe" gives a critical account of the 'Struggle for population' that has been undertaken by various countries in Europe, and further remarks "Most of them have net reproduction rates below unity.... If a country has a net reproduction rate persistently below unity and if the deficit is not made up by immigration, the population of that country will eventually disappear". Discouraging enough, as this prognosis is, the aspect is still more gloomy when the eventualities of recurrent devastating wars are considered, since war is always a dysgenic factor, destroying the best in the society and mainly affecting males more in the reproductive age-groups. Mr. H. G. Wells has always sounded a note of warning 'Adapt or Perish'.

Standard of Living

The above discussion will clearly show that on the social, economic, psychological and other grounds, the western civilisation needs a readjustment. To "Struggle for Population" and to defend it on nationalistic or racial grounds, and at the same time to advise the reduction of population on economic grounds in the slave-countries which are simply being exploited to maintain the high standard of comfort and luxuries in the European countries is simply an inequity which can no longer be hidden.

All these inequities seem to exist for either a want of definite adequate knowledge or for want of any definite higher aims than self-interest and self-preservation. Unless some idea of the 'optimum' population is formed, it will not serve any purpose to talk in terms of overpopulation or underpopulation. To fix up the population pattern, the qualitative study of the population is also essential as the quantitative. To decide the idea about the 'optimum', the ideas about the standard of living have naturally to be fixed. The standard of living not only varies to a great extent in different countries but also varies in different classes of the same society. From elementary needs of food, shelter and clothes, it includes in America an "Electric light and heating, laid on water supply, telephone, radio, automobile and facilities for participation in organised recreation." It is further remarked in the Technical documentation of the League of Nations[7] on "Population and agriculture with special reference to agricultural overpopulation" that "when these standards are compared with those of even the most advanced European areas it becomes clear how the optimum is a purely regional or at least a national matter." It should be noted here that simply referring to the standard of living as high or low, gives us absolutely no idea about its desirability or otherwise, but simply signifies the cost it will incur.

Population Problem in India

India is a vast country with many types of people and physical environments. The natural environments, agricultural possibilities, cultural and social orders are so different in different parts of this vast continent, that, to take any sweeping decisions on the crude figures for the whole country, may prove unreasonable. This fact is better recognised and appreciated by our rulers who have thoroughly utilised it for their benefit. For this reason, it would be more justifiable if the population problem in India is studied for different regions. The regions chosen shall naturally be physical and not political, in which there is a great similarity in culture and close-knit economy.

To take an example, Cochin[8] is one of the thickly populated regions of India. Since 1881 till 1931, the population of this small region has increased by more than 100%. The density of population has increased from 406 per sq. mile in 1881 to 961 per sq. mile in 1941. There are actually some areas which regularly support the population of 4,000 persons per sq. mile. The population is maintained on agricultural and allied industries. In addition to rice and coconut which is the chief product of this region tea, coffee and rubber are good commercial plantations which are also increasing. But it is not only the high agricultural produce that is responsible to maintain this density of population. It has been admitted by all that "the large growth and a high density in the tract, mainly agricultural in its economy, has been made possible by the extreme simplicity of the way of living that prevails amongst its people."

The average number of children per family in this region is 3·76 while the survival rate is 2·76. The net reproduction rate cannot be much above unity. According to Prof. C. Gini's[9] method of calculation of the population statistics "The rate required to replace the population in 1931 came to 1·398 while the actual rate obtained in that year was 1·437, not much above the required minimum." Now it would be very simple to evolve an acute problem of overpopulation in this region by introducing the ideas of high standard of living amongst its inhabitants on the European or American style. To induce them to use many costly commodities, which cannot be the real necessities of agricultural life in that region, would be a finer technique of creating a field for foreign industries. With this fundamental desire to raise the standard of ambitions for luxuries and comforts the whole social structure will show a change, and the desire to limit the family, which is a natural consequence of such state of affairs, will again make the foreign industry of birth-control measures flourish together with the creation of a likelihood of the fall of the net reproduction rate below unity, which at present seems to be just replacing. Is this change desirable?

In the nearest region of Travancore which is much similar to Cochin in practically all the matters, show a fertility rate of 6·5 children per family with the survival rate of 4·9 children per family. The net reproduction rate is nearly 1·8, much above unity. These figures for these two regions which are strikingly similar not only in physical environment but also in social structure, will clearly bring out the fact, how the social phenomena are entirely variable in even closely similar regions, and how a critical local study is necessary to talk anything of practical value. It is frankly admitted by Mr. N. V. Sovani in his book "The Population Problem of India" that "It is very difficult to point out the cause for this phenomenon."

Cause of Poverty in India

The simple statement, therefore, that the Indian population since the first census in 1872 has been on the increase and that it has more than doubled, leads us nowhere. It has already been noted in the previous paragraphs that the populations in all the European countries have doubled in the 19th century without any problem of over-population in its real sense. On the contrary, the wider application of scientific knowledge to agriculture and the rapid growth of industries produced a general increase in popular welfare. The urban industries in India at the end of the 18th century were very important and flourishing. Textile industry was spread practically all over India and *muslin* of Dacca was the finest in the world. A piece of finest *muslin* 20 yards long and one yard wide, could be made to pass through a finger ring and required six months to manufacture. Next to cotton was the woolen industry. Kashmir shawls were not only popular all over India but also in Europe. Benares was famous for its brass, copper, and bellmetal wares, Rajputana excelled in all types of stone-carving and enamelled jewellery. The number of industries in India was really very large. It is pitiable to note, that all these industries which added to the wealth and also to the prestige of the nation, have practically disappeared at the end of the 19th century. It cannot be argued that new industries have been added, if the old have disappeared. The beginning of the new industries was in new plantations of indigo, tea etc. These new industries only served for the introduction of European capital in this country and helped to exploit the natural resources of this country. It has been agreed even by the Indigo-commissioners,[10] that "Even the most advantageous statement made on favourable suppositions, shows but a slight profit derivable to the ryot from indigo." It will be clear from this statement that the indigo plantations were pushed in India only for the sake of the European capitalist and not in the least concerned with the welfare of the Indian peasant. Dr. D. R. Gadgil,[11] in his book "Industrial Evolution of India" frankly concludes that the extent of the new industries in India was "exceedingly small" and while the process of driving out the people from their old crafts was proceeding quickly, the growth of new industries to absorb the people thus displaced was in no sense proportionate."

It is really deplorable to discover that even the railway policy of the Government of India was directed towards two main aims (1) one was the military movements for strategical purposes, and secondly (2) to help the transport of raw materials from the interior of the country to the ports for export. Dr. D. R. Gadgil remarks: "Railway construction at this time looked more to the development of the foreign trade of the country than to growth of internal trade."[12] It will thus be seen that the Indian industries have been completely neglected and ingnored; and the so-called 'Trustees' of India have acted entirely even uptil now, against the interests of the trust they boast to protect. Whatever small improvements that may have been introduced in agriculture, the main item of improvement in the methods of agriculture, has been ignored to a great extent. There had been no concentrated and organised effort in this direction. The Indian agriculturist has, therefore, to depend upon nature to a great extent, and the danger of famine, is practically always threatening in one part of the country or another. The whole story of exploitation of this vast territory is now patently known and it will be too bold of anybody to make a statement that the cause of poverty in India only lies in its growth of population. One more factor which deserves our attention is that the 'self-sufficient village-economy in India was a very important factor, which ensured the protection of the rural populations in India in spite of the various changes in the political dominations that came time after time in the history of India. The compact form it gave to the village community, and a peculiar quality it developed of depending on the home-made stuff and a self-help, are extremely important factors, responsible for the protection and a steady growth of the village community irrespective of the invasions and changes in the systems of Government. This peculiar feature of Indian economic life, which ensured the high immunity against outside infections, was attacked by a steady introduction of the western ideas and ideals in this country. This tendency which was widespread, not only helped the rapid decay of the high class Indian art industries, but created a standard of living in which the dependence on foreign commodities at once increased. With the position the educated middle classes enjoyed in the society, and the rapid extension of communications in the Indian village, the same ideas of the mode of living spread very easily to all the other classes and the peculiar feature of the self-sufficient Indian economy was completely destroyed. The above discussion will make it pretty clear that the existing poverty of the country, is largely due to the alien exploitation than the growth of population. Now the argument, that the increase in the means of subsistence, even after the application of scientific knowledge available, will be limited as compared with the growth of population, that is supposed to be inevitable due to

the wider application of preventive medicine, does not stand to reason, when we look to the present condition of the European countries. The application of the knowledge of prevention and cure of disease will help to reduce the death-rate to a certain extent, but not below a certain minimum and a balance of population will have to be maintained by a constant birth-rate. We have already seen that our knowledge has not yet reached a stage, when such problems can be reduced simply to mathematical formula. The European countries at present, where, both these factors, which should lead to the continuous increase of population, are in existence, show an evidence to the contrary. The wider application of scientific knowledge to the production of the means of subsistence, the general rise in the standard of luxuries and comforts with increased personal and national ambitions, the consequent tendency to limit the family and the eventualities of recurrent 'devastating wars' to fulfill the same, seem to be an inseparable train of circumstances, leading ultimately to a decline of population. It will be seen, therefore, that the ultimate fear of overpopulation, pressing upon the means of subsistence, seems to be so doubtful, that it may not materialise at all. On the contrary, an anxiety is created in many a thinking mind in Europe at present, that if this decline continues for long, the western civilisation may completely disappear.

Is it not, therefore, unreasonable to accept the assumptions of Mr. Blacklock, which look more foolish than bold, in the light of the facts given above? Such articles, therefore, even if they are written with the best of the intentions towards the 'teeming millions' in India, simply serve to add insult to injury already inflicted during the last 150 years. I need not remind Mr. Blacklock, the eventualities of destruction and famines, that India will have to face due to the present self-centred policies of the fighting nations, and I believe that if our trustees leave us alone in thought and also in action we shall be able to adjust ourselves in a way, that may prove to be the minimum of loss and destruction. Our ideas of culture and civilisation are so well-knit and enduring that they have stood the test of the time so long, and the western nations will have to learn a lot to come to the conclusions, which will ensure a longer life for themselves and also an enduring peace for the world.

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URINARY COMPLICATIONS FOLLOWING THE ADMINISTRATION OF SULPHAPYRIDINE

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From an Indian Field Laboratory, C. M. F.

Sulphonamides are so commonly used these days that every untoward effect produced by them should be known. This note describes the experience in one case with Sulphapyridine (M. & B. 693).

Case history—A British officer, aged 32, well developed and generally healthy, was admitted into hospital on 10-9-42 with urinary discomfort.

History of present illness—Feeling of heaviness in perineum on 6-9-42. Slight urethral discharge in morning of 7-9-42; given two slides by R.M.O. with instructions for taking smears, and also 18 sulphapyridine tablets to take afterwards in divided doses as usual. No further discharge either this day or later and slides not used; but 8 tablets taken on 7-9-42.

Remaining tablets taken, finishing them by evening of 8-9-42 when he had great difficulty in micturition; catheterised at night; urine reported to be clear.

Catheterisation was necessary again; on 9-9-42 urine reported blood stained.

Great physical discomfort on 10-9-42; severe colicky pain in right renal region radiating to penis. On catheterisation no urine obtained, and patient was sent to hospital.

Past history—5 years ago the patient had gonorrhœa which was apparently successfully treated. Sulphapyridine was not used being, then, not available.

18 months ago he received "a large dose of sulphapyridine for chill and sorethroat". Next day had blood in urine and severe left sided renal colic. Admitted to hospital, apparently very ill, with suppression of urine, and could remember little except that he had continuous intravenous fluids; cystoscoped several times and was told that he had a stone or growth in the bladder. Recovered after three months in hospital and had been quite well till present illness.

On admission—Extremely ill, anxious, very irritable, and abrupt in speech; temperature 101°F. Vomiting and complaining of great pain in abdomen. Tongue furred and dry. Chest normal. Abdomen—bladder slightly distended; great tenderness in right renal angle and over bladder. Kidneys not palpable. Liver and spleen not enlarged. Prostate normal; no discharge on massage.

Catheterised, 10 ounces of blood-mixed urine obtained. There were many pus cells in the urine and on culture B. coli was found. There was also a number of other organisms but they were not studied further. Provisional diagnosis of post-sulphapyridine hæmaturia with secondary infection was made. For treatment, alkalinisation of urine aimed at by means of the usual alkalinising drugs.

Patient felt a little easier on 11-9-42; still has right sided colic. Straight x-ray showed no abnormality in kidneys.

Cystoscopic Examination:—Urine a little clearer; base of the bladder covered with crystals. Right ureteric orifice was patulous and protruding from it was a beautiful rose-bud of crystals. These were fixed, probably with a mucous exudate, and could not be detached by a catheter, nor could a catheter be passed up this ureter. No excretion of urine seen on this side. Left ureteric orifice was apparently quite normal; no scarring or other evidence of any previous operative interference. Excretion of urine apparently quite normal. The

bladder was washed out with fairly strong sodium bicarbonate solution in an effort to dislodge the crystals. Catheter now passed with difficulty for ½ inch into right ureter, and the sodium citrate solution injected, apparently without result. The urine obtained by catheterisation showed:—

Pus cells ++++, R.B.C. ++, casts nil. Coffin-shaped thin transparent crystals present; these were indistinguishable from the crystals of sulphapyridine. Chemical test for sulphonamide positive. On culture a large number of staphylococcus albus and a few B. coli. Blood urea 75 mgms.

The patient had to be catheterised again at night.

There was retention still on 12-9-42; urine slightly clearer; general condition improving. On 13-9-42 the patient felt better; urinated normally during the day. The patient went on improving and urine became clearer.

Cystoscopic examinaton was done on 17-9-42 under local anæsthesia. Only a few crystals seen at the base of the bladder. Right ureteric orifice now clear but slightly patulous, urine being excreted. Indigo-carmine injected intravenously and excreted on the right side in 11 minutes and on left in 8 minutes, excretion thus being normal. The urine showed a few pus cells, and a very few sulphapyridine crystals, heavy staphylococcus and slight B. coli. infection.

Urine had been kept continuously alkaline since admission; sulphapyridine 1 gm. 4 hourly started on 21-9-42; fluid intake reduced to 80 ozs.* per day, and alkalies continued.

Total sulphapyridine given upto 26-9-42 was 29 gms.; the urine showed a slight staphylococcus albus infection only; albumen still present. Urine output increased from 26 ozs. on 21-9-42 to 52 ozs. on 26-9-42.

Alkalies were stopped on 27-9-42 and ammonium chloride ½ gm. four-hourly started. Chemical test for sulphapyridine in urine was negative. The urinary output was 60 ozs.

The temperature was low but continuous till 28-9-42 when it touched normal; ammonium chloride ½ gm. and mandelic acid 3 gms., four-hourly were started (*i.e.*, total daily ammonium chloride gms. 2 and mandelic acid gms. 12).

General condition was excellent on 30-9-42. He was mentally quite fit. Blood urea was 65 mgms. %. The urine showed a trace of albumen and a very few staphylococci, and no other abnormality. The output had averaged 55 ounces.

Fluid intake reduced to 40 ozs. on 2-10-42 daily to help more rapid acidification of urine.

Blood urea was 48 mgms. % on 4-10-42.

Mandelic acid was stopped on 6-10-42; urine throughout the mandelic acid treatment kept below pH. 5·4 (tested with methyl red).

General condition was normal on 10-10-42; mentally quite fit; urine sterile but had a faint trace of albumen.

Patient discharged on a month's sick leave on 12-10-42.

He was readmitted on 8-11-42 for examination. Very fit; no symptoms; urine normal (examined twice in the interval). He was discharged again on 10-11-42 and put to duty.

The report on June, 1943: "Doing full work in the Western Desert, and very fit indeed."

Discussion

Both attacks of renal colic and hæmaturia are directly associated with the ingestion of sulphapyridine. The sequence of events in the present attack is easy to follow. Prostatic secretion was mistaken for gonorrhœal discharge, and the ensuing fear, because of the previous experience of gonorrhœa, led the patient to take the tablets, even when there was no further discharge. Sufficiently large amounts of water were not taken at the same time, and sulphapyridine crystallized out in the acid urine. It is permissible to speculate whether the man's urine was unduly acid at the time; it was certainly sufficiently acid to cause crystallisation, perhaps the B. coli. infection adding to the acidity. The aggregation of the crystals, in the narrowest part of the right ureter caused a mechanical block to the passage of urine wihch by reflex action diminished the secretory powers of the kidneys. The renal colic and hæmaturia were due to the local action of the crystals. The fall of blood urea and the improvement in the general condition of the patient ran directly parallel with the disappearance of the sulphapyridine crystals from the urinary system. The dysuria of 7-9-42 and 8-9-42 was due either to spasm of the prostatic part of the urethra or to congestion of the prostate itself, the prostate after gonorrhœa being more liable to spasm.

Why in the present attack only the right side was affected while 18 months ago it was only the left, is not well understood. Had ingestion of the drug been persisted in, perhaps the other side too would have been affected. The further exhibition of sulphapyridine which had caused so much trouble in the case was considered by some to be unwise. There was, however, no real risk in this; as long as the urine was kept alkaline the drug could not crystallise out, as the drug is soluble in alkali. It is also clear from this that the patient was not sensitive to sulphapyridine.

The abrupt changing over of the reaction of the urine from alkali to acid was necessary to clear it of the infection which was possibly due to catheterisation. There was again no risk of sulphapyridine crystallising out; this drug is very easily excreted by the kidney, and an interval of over 24 hours was given before resorting to ammonium chloride. By the time the urine did, in fact, become potently acid, very little of sulphapyridine was left in the body; nothing was traceable by chemical tests on the urine.

Mandelic acid is usually contraindicated in the presence of renal complications. It itself can produce albuminuria and hæmaturia; yet in the present case the drug did not cause any untoward symptom—nor was it expected to do so. There is no evidence to show that the kidney tissue itself was damaged, and it has already been argued above that the kidney function was depressed by reflex action. If the kidney tissue is undamaged, mandelic acid can be given with safety, and the kidney of this particular patient ran no greater risk than any other.

This case illustrates that it behoves every medical practitioner, before advising sulpha-drugs to ascertain from the patient, if such drugs have been taken before and with what effects. Our patient was advised to note his experience in his personal documents and to mention it whenever he was to take such drugs again. It is advisable to make appropriate entries of such experience in soldiers' pay books as well.

Acknowledgment

Thanks are due to Lt-Col. M. J. Malley, R.A.M.C., Officer Commanding of a British General Hospital in the Middle East for permission to publish the case; much is owed to Major P. W. Ingram, the Surgical Specialist of the hospital, who allowed free access to the case and the case notes, and to Major N. F. Coghill and Mr. A. C. Lahiri for help.

*Why fluid intake was reduced is not properly understood. The usual procedure is to give about 2,000—3,000 c.c. of water per day.—Ed., *J.I.M.A.*

SPECIAL ARTICLE

A NEWER CONCEPTION OF TRIDOSA

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दोषधातुमलमूलं हि शरीरम्—सु-सु-१५।३

i.e., the essential component parts of the body and their functions depend on the *Dosas, Dhatus* and *Malas*. The functions of the *Dosas*, both in normal and abnormal conditions are to regulate all the functions of the body. The *Tridosa*, thus, are the controlling authority of every constituent of the body including the *Dhatus* and the *Malas*. The origin of the controlling functions of *Tridosa* are again divided, so that *Vayu* is self-origined principle, *Pitta* originates from fire and *Kapha* from the fluids of the body as described by Susruta (S.S.42/4)

तत्रवायुरात्मेराग्नेयं, पित्तमाग्नेयं, श्लेष्मा सौम्य इति।

Of these three *Dosas, Vayu* is the prime mover which again, activates the *Pitta* and the *Kapha*, as described by Sarngdhara (Purba 5/22).

पित्तं पंगु कफः पंगुः पंगवो मलधातवः।
वायुना यत्र नीयन्ते तत्र वर्षन्ति मेघवत्॥

It thus forces one to study how *Tridosa* perform their respective regulating functions, particularly from the point of view of the fact that Ayurveda recognises only 3, not more neither less, regulating authorities in our body the *Vayu, Pitta* and *Kapha* which control all systems and all functions of the body. Naturally one enquires what are these 3 all-important controlling substances.

A vast amount of material is available in the Ayurvedic literature regarding the functions of *Tridosa*, but nowhere this subject has been dealt with in the form of discussion of their nature, excepting in one chapter of Caraka Samhita, the *Vatakalakalia* chapter. (C.S. 12.) The available material is found scattered all over the literature. This is true not only in the original works, the *Samhitas*, but also with those of the redactors and even with the commentators. The interpretation of *Tridosa*, has, thus, through all ages, been left entirely to the individual teacher and from him to his pupils.

With a view to study this basic principles of Ayurveda, an attempt has been made by me to collect all available passages from the *Samhitas* indicating the functions of *Tridosa* and to classify them in terms of modern physiology. The result of this attempt is detailed below:

VAYU

The *Samhitas* present us with at least 141 manifestations of normal *Vayu* and 821 of abnormal *Vayu*. It is remarkable that all these 962 manifestations of *Vayu* can be most appropriately classified in terms of modern physiology as follows:

(1) Symptoms due to normal and abnormal mental functions, (2) those of special sense organs, (3) those of cardiac action, respiration, deglutition, (4) those of speech, (5) those of digestion, (6) of excretion, (7) of vasomotor system, (8) motor functions, (9) sensory functions, and (10) general functions.

From the first nine headings of this classification it is evident that all functions of *Vayu* represent the functions of the nervous system. The last heading indicates the general functions and we shall indicate hereinafter that this general function regulates the individual function of every cell of our body, including, of course, the nerve.cell. The above classification thus reveals that *Vayu* has twofold functions (1) general function with respect to each individual cell of our body, representative of every civil citizen of any state and (2) special function and that of the nervous system, representative of the government in any state, with various departments and personnel. It is remarkable that only one passage of the Caraka Samhita (C.S. 12/8) indicating 17 functions of *Vayu*, supplies the inherent clue to this classification and all the rest of 962 manifestations of *Vayu* arrange themselves according to this classification. This passage runs as follows:

१। वायुस्तन्त्रयन्त्रधरः, २। प्राणोदान समान व्यानापानात्मा, ३। प्रवर्तकश्चेष्टानामुच्चावचानां, ४। नियन्ता प्रणेता च मनसः, ५। सर्वेन्द्रियाणामुद्योजकः, ६। सर्वेन्द्रियार्थानामभिवोढा, ७। सर्व शरीर धातु व्यूहकरः, ८। सन्धानकरः शरीरस्य, ९। प्रवर्तको वाचः, १०। श्रोत्रस्पर्शनयोर्मूलं, ११। हर्षोत्साहयोर्योनिः, १२। समीरणोऽग्नेः, १३। दोषसंशोषणः, १४। क्षेप्ता बहिर्मलानां, १५। सूक्ष्माणु-स्रोतसां भेत्ता, १६। कर्तागर्भाकृतीनां, १७। आयुषोऽनुवृत्ति प्रत्यय हेतुभूतः।

This means "*Vayu* in normal condition is (1) the regulator and supporter of all the component parts of the body, taken both collectively and individually. (2) It exists in the fivefold form of *Prana, Udana, Samana, Vyana* and *Apana*. (3) It is the urging cause of movements of diverse kinds. (4) It restrains the mind (from all undesirable objects) and concentrates it (on objects that are desirable). (5) It causes all the (ten) senses (of knowledge and action) to perform their functions. (6) It bears all the objects of the senses (after contact with the senses) to the mind. (7) It holds together all the elements of the body. (8) It assists the cohesion of the particles of the body. (9) It causes speech. (10) It is the prime cause of touch and sound. (11) It is the origin of joy and cheerfulness. (12) It excites the heat of fire. (13) It dries up all faults. (14) It throws out all impurities. (15) It pierces through all the ducts of the body, gross and fine. (16) It gives form to the embryo in the womb. (17) It furnishes evidence of the existence of life. The *Vayu*, when unexcited, achieves all these functions." (English translation of Caraka Samhita by Avinash Chandra Kaviratna).

Classification of Vayu—The passage quoted above indicates 17 functions of *Vayu* of which the second item indicates the names of 5 kinds of *Vayu*. The remaining 16 may now be arranged according to the above 10 headings as follows:—

(1) Mental functions—4. restrains the mind and concentrates it. 11. origin of joy and cheerfulness.

(2) Functions of special senses—5. causes all the senses to perform their functions. 6. bears all the objects of the senses to the mind, 10. prime cause of touch and sound.

(3) Function of the heart, lungs and intake of food—1. regulates and supports the constituents of the body, 17. furnishes evidence of the existence of life.

(4) Function of speech—9. causes speech.

(5) Function of digestion—12. excites the heat of fire.

(6) Function of excretion—13. dries up all faults, 14. throws out all impurities.

(7) Vasomotor functions—15. pierces through all the ducts of the body, gross and fine.

(8) Motor functions—3. the urging cause of movements of diverse kinds.

(9) Sensory functions—10. prime cause of touch.

(10) General functions—7. holds together all elements of the body, 8. assists the cohesion of the particles of the body 16. gives form to the embryo in the womb.

It appears from the above classification that the function of *Vayu* consists of the above ten groups. In the same passage it is noted that *Vayu* consists of 5 kinds *viz., Prana, Udana, Samana, Vyana and Apana.* Re-classifying the above first 9 groups in terms of these five kinds of *Vayu*, it appears that—

A. *Prana Vayu* is responsible for (1) mental functions, (2) functions of the special senses (minus that of touch), (3) functions of the heart, lungs and intake of food.

B. *Udana Vayu* is responsible for (4) the function of speech.

C. *Samana Vayu* is responsible for (5) digestion of food.

D. *Apana Vayu* of (6) excretion of fæces, urine, menstrual blood and fœtus.

E. *Vyana Vayu* is responsible for (7) vasomotor functions, (8) functions of locomotion and (9) of sensation.

A perusal of the above classification shows that all these 9 groups indicating the special functions of *Vayu* are manifestations of nervous system. It may thus be concluded that *Vayu* of Ayurveda is the same thing as the nervous system of modern physiology. Nay, something more, as will be evident, when the last group of the classification, *i.e.*, the general functions of *Vayu* are considered.

It will be convenient to discuss this aspect of the function of *Vayu*, if an analogy is made indicating the function of *Vayu* with that of the government of a country.

Thus the *Prana Vayu* performs the function of the king as regulator of the mind, the first group of the above classification. The second group—function of senses as the minister of information, the third group—function of heart, lungs and intake of food as the minister of interior. *Udana Vayu*, the fourth group, as regulator of speech, performs the function of education and propaganda minister; *Samana Vayu* the fifth group, by regulating digestion and producing the nutrient element of the body, serves the function of minister-in-charge of agriculture, industry, commerce and being collector of the nutrient chyle as the finance minister; all these essential services combined in one. *Apana Vayu* as minister-in-charge of health, while *Vyana Vayu*, the last three groups serve the function of internal transport minister (vasomotor function), international transport minister (locomotion) and part of information minister (sensation). In this analogy *Atma*, the soul may be compared with the emperor commanding over the *Prana Vayu*, the king of the body.

So far we have discussed *Vayu* as representative of the government of our body state as the nervous system. But who are the governed? Apparently each individual cell, representative of each civil subject of a country is being governed by the nervous system, the government of the body state. The general function of *Vayu, i.e.*, the last group of classification, is with respect to the function of each individual cell of the body. Caraka says—

वायुराबुबलं वायु र्वायु र्धाता शरीरिणाम।
वायुर्विश्व मिदं सर्व्वं प्रभु र्वायुश्च कीर्तितः ॥—C. Ch. 28|2.

i.e., "*Vayu* is the life, *Vayu* is strength, *Vayu* is the creator of the body. *Vayu* is the universe (of the body constituents) and *Vayu* is found as the chief."

The general functions of Vayu—The general functions refer to those of each individual cell of the body. It may appear anomalous to conceive the functions of *Vayu* in terms of modern cellular doctrine, considering that the conception of cell was unknown to the ancient Hindus. One passage from Caraka may be cited to contradict this suggestion. This is as follows—

शरीरावयवास्तु परमाणुभेदेनाऽपरिसंख्येया भवन्ति अतिबहुत्वादति सौक्ष्म्यादतीन्द्रियत्वाच्च : तेषां संयोगविभागे परमाणवो कारणं वायु र्कर्मस्वभावश्च। च-शा—८।१२

i.e., "the parts of the body are innumerable according to the number of minutest particles, as they are extremely numerous, extremely minute, so much so, that they are beyond the range of all senses. In the union and disunion of these *Paramanus*, the causes are *Vayu*, the acts and Nature." These *Paramanus* of our body, in terms of modern anatomy, are the cells. That different groups of these cells form tissues, come to be in Ayurvedic language as the *Dhatus*. Ayurveda recognises 7 chief *Dhatus*, the supporters of the body parts, *e.g.*, the *Rasa* (often termed as skin—Ref. C. Ch. 28|9), the blood, muscle, adipose tissue, bone, marrow and the semen. There are also several *upadhatus, i.e.*, accessory *Dhatus*. The component elements of all these *Dhatus*, the tissues, are the cells. That substance in each individual cell, which regulates its function represents the general function of *Vayu*. For the purpose of convenience in expressing the conception of this general function of *Vayu*, let us take the instance of 2 cells (1) the white cells of the blood and (2) the spermatozoa which can be taken outside the body and all their functions can be studied outside. Two other cells, the amœba and the malaria parasites, both unicellular animals may also be studied. These 4 cells are all mobile, *i.e.*, they show independent movement of their own whether inside the human body as well as outside. According to Ayurveda, all forms of movements are due to *Vayu* exclusively.

All these 4 cells, the white blood cells, spermatozoa, the amœba and the malaria parasites show—(1) locomotion, (2) response to irritation and stimulation, (3) self-protection, (4) search for food, (5) engulfing the food, (6) digestion of the same, (7) separating the digested material into essence and waste, (8) assimilation of the essence, (9) excretion of the waste and that they (10) can be cultivated for generations (in artificial media in a test tube where they multiply and show all the above function in artificial culture).

All these functions are those of *Vayu* according to Ayurveda and as these cells perform all these functions in the artificial culture and that when separated from the human body, it is evident that there is no question of regulation of these functions by the nervous system of the human body, *i.e.*, the government. These cells, then, possess mechanism of independent regulation. This, in terms of the analogy of the government and the civil citizen, comes to mean that each individual cell, representing the citizen, perform its day to day function by the *Vayu* present within itself just as the citizen performs his day to day function according to his own con-

science or own laws regulated by his own sense of duty. The nervous system, on the other hand, represents the laws of the government which regulate the citizens collectively. *Vayu*, thus comes to be essentially, the guiding material present in each cell. As the government officials perform the function of the government by their own sense of duty regulated by government laws, we may conclude that *Vayu* is the substance in each cell regulating its function, including that of the nerve cell, which cell represents the government official. Susruta also explains that **"भिन्नानिल यथाङ्गेषु नामस्थान क्रियाभेदोः"** That is, all *Vayus* are the same thing, they are called by different names only according to their different seat and function. The five kinds of *Vayu* are so named only because they have different functions to perform. These fivefold function is evident only in higher animals, the human beings. Thus *Udana Vayu* is not in existence in animals belonging to the group of fish and downwards. In fact, the nervous system is not differentiated in amœba. As we rise in the animal kingdom, we find the nervous system in the form of only a few isolated cells in the hydra, an animal of low order. In jelly-fish, a sea animal, the nervous system appears in the form of a net. In the earthworm we find the first appearance of definite nervous system with first formation of brain-like structure. This differentiation of the nervous system becomes more and more definite as we rise in the animal kingdom, *viz.*, the prawn, the mosquito, cockroach, snail, fish, amphibia, reptiles, birds and mammals. This differentiation is necessary to correlate the impulse entering into the body from outside through the special senses and to respond to these impulses through the function of locomotion, etc. Thus the amœba possesses only the general *Vayu*, while the higher animal shows differentiation into the special forms of *Vayu* as the nerve cells specialise, higher the animal rises in the order. There, again, the nerve cell as other cells of the body perform their function through *Vayu*. Thus the general *Vayu* in different cells, *e.g.*, the nerve cell, liver cell, kidney cell, muscle cell, bone cell, etc., perform special function, and these cells differ one from the other in function only because of *Vayu* having different functions in these cells according to the nature and composition of the cell units.

The form of Vayu—It has been shown that *Vayu* is that substance in every cell which regulates all its functions. In a nerve cell, the *Vayu* is that matter or substance which generates the energy, the nerve impulse. What is the form of this substance? One does not know.

The Hindu philosophy enunciates the principle that no function can be performed without some energy and energy cannot exist without matter or, in other words, there is no matter without energy and no energy without matter. From the point of view of this principle it may be asserted that as *Vayu* possesses enormous energy there must be some matter which is the producer of the energy. What is this matter in every cell, evidently in the nucleus, and particularly in the nerve cell? Caraka has given the answer very briefly, **वायु अव्यक्तो व्यक्त कर्माच** *i.e.*, "Vayu cannot be described, it is evident by its functions." This indicates that this matter is so subtle that is not perceived by any senses hence cannot be described **(अव्यक्त)** but by means of its functions it is fully known **(व्यक्त)**. This fineness is not due to smallness of size but due to non-density **(अनिविड़ावयवत्व)** and diffusion or universal distribution **(व्यापकत्व)**

PITTA

Like *Vayu*, *Pitta* also has twofold functions, (1) general function and (2) special function. (1) General function of *Pitta* is **अग्निरेव शरीरे पित्तान्तर्गतः कुपिताकुपितः शुभाशुभानि करोति** —C. S. 12|15.

i.e., "the fire which exists in the body as *Pitta*, being normal or abnormal, produces good or evil." Ayurveda recognises seven *Dhatvagnis* one for each *Dhatu*. This in modern physiology are the inherent enzymes in each tissue of the body which by their action produce (1) the assimilation of the materials derived as the product of digestion of the food and (2) this metabolism leads to the production of waste materials. The nature of *Dhatvagnis* may now be considered in detail. Modern physiology teaches us that every cell of animal body contains enzyme which takes part in nutritional processes and thus maintains the metabolism of the cell. This enzyme, in Ayurveda, is called *Dhatvagni*, the *Agni* of the seven *Dhatus* of our body. Blood and lymph bring the nutrient material to every cell but what makes the bone to retain only the calcium and phosphorus from it, the subcutaneous tissue only the fatty material? This selective action is maintained by the special selective function of the respective *Dhatvagni*, *i.e.*, the enzymes which transform food into our body constituents. Enzymes or ferments are complex colloidal nitrogenous organic compounds. They act as catalysts and a minute trace of which accelerate the chemical reactions to an enormous extent but themselves undergoing little or no change in this chemical process. Thus a minute trace can induce a tremendous reaction. They are the products of living cell and act specifically on nonliving matter. The process of digestion by the various digestive enzymes the special form of *Pitta*, the *Pacaka Pitta*, in the alimentary canal are too well known. Their function is to disintegrate the food material into simplest compounds, the units from which the body constituents are to be reconstructed. We are more concerned here with the general *Pitta* of every cell, *i.e.*, the enzymes having the function of resynthesis inside the body cells of the building units reaching the cell by the blood and lymph channels. There are 26 aminoacids coming to each individual cell by way of the blood. Every cell takes up different combinations of these 26 aminoacids and it is this property which makes the liver cell different from the skin cell, brain cell, muscle cell and in fact every one cell from every other cell. There must be various enzymes to perform this function in the resynthesis of these aminoacids and utilizing them for the purpose of growth and maintenance of the individual cell. The carbohydrates and fats, the energy producers of the body, are requisitioned by the enzymes to yield energy and heat as per formula $6C_6(H_2O)_6$, *i.e.*, glucose+$6O_2$=$6CO_2$+$6H_2O$+heat+energy. From glucose to CO_2+H_2O there are different stages to undergo. All these changes are done by the enzyme, the general *Pitta* in each cell. That enzyme is the factor is easily recognised by the fact that any amount of oxygen from a cylinder when passed through a solution of glucose for any period will never produce CO_2, H_2O, nor any energy and heat. It appears, thus, that the food materials are broken down into elementary products by the action of enzymes, the *Pacaka Pitta*, these elementary products are again synthetised by enzymes the *Dhatvagni* or *Pitta* of every cell to repair the cell from the effects of wear and tear, to maintain further growth of the cell and also to supply the energy and heat for the execution of the function of the cell. The enzymes, thus, are the agents which transform food into our body constituents

and make them efficient to perform their respective function. These enzymes constitute the *Pitta.*

Hormones, the regulator of the enzymes—The function of the intracellular enzymes, in resynthesising the aminoacids into the cell-protein and transforming the glucose etc. into production of energy and heat, are being regulated by hormones, the *Sadhaka Pitta* the secretion of the ductless glands. Thus, the pancreatic secretion containing the powerful enzymes (the *Pacaka Pitta*)—trypsinogen, amylase, maltase, lipase etc. and of the succus entericus, the enterokinase, erepsin, invertase, etc., will not be secreted if there is no secretin, the hormone produced in the duodenum. There may be normal quantity of glucose in blood or even in great excess (hyperglycæmia), *e.g.,* in diabetes, but unless the hormone insulin is there no glucose will be utilized by the cell to produce energy although the cell is starving for glucose. This amounts to the event that one has the godown full of sugar but as the godown is locked he has to take tea without sugar. Here the lock represents the hormone. The same event takes place with respect to fat metabolism, particularly the oxidation of the keto acids by the anterior pituitary hormone, the "ketogenic hormone", with mobilisation of calcium and phosphorus by the parathyroid hormone, that of iodine by thyroxine, that of water and salt by suprarenal cortex, etc. The whole general metabolism is being regulated by the thyroid. Pituitary by various hormones also regulates the function of various enzymes regulating metabolism inside the cells, particularly through the growth hormone, thyrotrophic hormone, parathyrotrophic hormone, adrenotrophic hormone and diabetogenic and ketogenic hormones. This, in brief, is the outline of the function of the *Pitta,* the enzymes and hormones with respect of metabolism. These hormones, as described in detail elsewhere, are represented by *Sadhaka Pitta.* It appears thus that these functions are maintained by *Pitta* as *Agni* particularly *Dhatvagni* under the control of *Sadhaka Pitta,* the hormones.

(2) Special functions of *Pitta*—These like *Vayu* are fivefold and perform function under different names. Thus (1) *Pacaka Pitta* represents the enzymes of the alimentary tract, *viz.,* ptyalin, pepsin, trypsin, enterokinase, etc., which are the agents to digest the food; (2) *Vrajaka Pitta* represents the secretion of (*a*) sebum which gives the glossy appearance **(कान्ति)** of the skin and (*b*) sweat which regulates and maintains the constant body temperature the **कायाग्नि or देहाग्नि** (3) *Ranjaka Pitta* the enzyme, hœmopoietic principle, present in the liver which activates the bone marrow to produce blood corpuscles. (4) *Alocaka Pitta,* the secretion of the ciliary body and also the rodopsin the main functionating element of the retina. (5) *Sadhaka Pitta* the regulator of courage, fear, anger, etc., which according to modern physiology are the function of the suprarenal and the pituitary.

The nature of *Pitta,* thus, comes to be of the nature of enzymes and hormones and in some instances simple secretions.

Kapha

Like *Vayu* and *Pitta, Kapha* has also twofold functions—(1) general and (2) special. The term **श्लेष्मा** is derived from **"श्लिष"** means that which joins and supports. (1) The general function of *Kapha* is to compose each cell of our body and to support it by the essence of food, the chyle. The chyle **(अन्नरस)** enters the heart first and through this the whole body. Susruta, thus, says **उरस्यश्लिक्कसन्धारक्षात्मवीर्य्ये क्षान्नरस सहितेन हृदयावलम्बनं करोति**—S. S. 21|18.

This means that the *Kapha* present in the chest supports the **त्रिक** as well as the heart by means of strength of the chyle. That the heart is directly related with *Kapha* is mentioned in *Agnipuranam* thus **हृदयं पद्मसन्निभम्। अधोमुखं तप्तुषिरं यत्रजीवं व्यवस्थित।—अग्निपुरान २७०।१३**

i.e., the lotus-shaped heart is formed of Kapha. The heart is pointed downwards and is hollow and it is there that the *Jiba,* the life is situated. Like the heart all organs, tissues and cells are composed of *Kapha.* The heart is also the seat of *Rasa.* The *Rasa* not only supports the heart but also the whole body. Thus **पुरुषोऽन्नरसमय** *i.e.,* the *Cikitsapurus, i.e.,* the body which is the object of treatment is composed of *Rasa.* This is the general function of *Kapha,* the substance which forms the composition of every part of the body. (2) The special function of Kapha are fivefold according to their seat of origin. Thus (*a*) *Abalambaka Kapha, i.e.,* the body water which constitute 70 per cent of our total body weight exist in every cell of the body and it is this *Kapha* by which the cells are joined together and through this the cells can draw the food material from the chyle (*annarasa*) and excrete the waste material which also must be in solution. A derangement of this *Kapha* leads to production of œdema, etc. This fluid element, the *Abalambaka Kapha* is the vehicle of *Rasa* the seat of which is the heart and whence it is distributed throughout the body to support it and to make up the loss due to wear and tear. (*b*) *Kledaka Kapha*—**आमाशय सम्भवति श्लेष्मा मधुर शीतल** *i.e.,* this *Kapha* remaining in *Amasaya* moistens the food material and also moistens the fæcal matter for easy evacuation as also remaining in the respiratory passages allows normal breathing to take place. (*c*) *Rasaka or Bodhaka Kapha*—**जिह्वामूलकण्ठस्थो जिह्वेन्द्रियस्य सौम्यत्वात् सम्यग रसज्ञाने वर्तत**—(S. S. 21|18). This *Kapha* keeps the tongue moist and helps to ascertain the taste of the food. (*d*) *Sleshaka Kapha*—**सन्धिस्थस्तु श्लेष्मा सर्वसन्धिसंश्लेषात् सर्वसन्धनुग्रहं करोति।**

—S. S. 21|18.

This *Kapha* joins together different constituents of the body. It not only joins one bone with another at the joint but also muscle or tendon with bone, one group of muscle with another, skin with subcutaneous tissues, etc. Thus *Sleshaka Kapha* unites one coarse structure with another coarse one while *Abalambaka Kapha* unites the finer structure, the cell, with another finer one. (*e*) *Tarapaka Kapha*—

शिरस्थः स्नेहसन्तर्पणाधिकृतत्वादिन्द्रियाणामात्मवीर्येणानुग्रहं करोति।

—S. S. 21|18.

This sooths the brain and also the eye. It thus represents the cerebrospinal fluid and the aqueous and vitrous humours of the eye.

The nature of *Kapha,* thus, comes to be the material composing the cell including the body water.

Conclusion

In a previous communication (Banerjee, 1943), it had been sought to explain *Vayu* as the nerve impulse conducted through the nerves; *Pitta* as the function of all the glands of our body and *Kapha* as the body water and the support-

ing and lubricating system of our body. Ayurveda recognises the *Tridosa* as matter and not energy or force. Thus to call *Vayu* representing as nerve impulse, *i.e.*, an energy cannot be approved. Hence question arises regarding the nature of *Vayu, Pitta* and *Kapha*. As a result of further scrutiny, a newer conception of *Tridosa* is hereby presented which may be summarised as under—*Vayu, Pitta* and *Kapha* are very subtle matter existing in our body in two forms.

(1) General, *i.e.*, present in every cell of our body and are essential for all the functions of the cell. The nature of *Vayu*, the controlling authority of the cells' function, cannot be described and is evident only by its qualities. *Pitta* and *Kapha* can function only when the *Vayu* in the cell activates them. Although *Vayu* cannot be described, its seat may be located in the nucleus of the cell. The special function of the nerve cell is also performed by the presence of *Vayu* in the nerve cell. *Vayu* is not the nerve impulse itself but the substance present in the nerve cell which produces the nerve impulse is *Vayu*.

Pitta is the enzyme present in every cell which performs the day-to-day function of every cell of our body and this is termed in Ayurveda as *Dhatvagni, i.e.*, the *agni* (fire) of the tissues.

Kapha is the substance which forms the physical and chemical composition of each individual cell.

It appears thus that *Kapha* is a subtle substance, *Pitta* finer and *Vayu* finest of all.

(2) Special, *i.e.*, possessing different names according to special site and function. Each of *Vayu, Pitta* and *Kapha* exists in 5 special forms.

Vayu is of 5 forms and represents the nervous system—central, peripheral and autonomic. These are—(*a*) *Prana Vayu* regulating—(*i*) mental functions, (*ii*) functions of special senses, (*iii*) cardiac functions, respiration, deglutition; (*b*) *Udana Vayu* regulates speech; (*c*) *Samana Vayu*—digestion; (d) *Apana Vayu*—excretion and (*e*) *Vyana Vayu*—vasomotor function, motor and sensory functions.

5 kinds of *Pitta* are the different special enzymes, hormones and secretions which can come out of the cells and perform their respective function in distant parts. Thus (*a*) *Pacaka Pitta*—the enzymes coming out of the digestive glands and digest the food, in the alimentary tract. (*b*) *Vrajaka Pitta* of the skin regulates body temperature and glossy apperance of the body by secretion of sweat and sebum respectively. (*c*) *Ranjaka Pitta*—the hæmopoietic principle of the liver which activates bone marrow to produce red blood cells. (*d*) *Alocaka Pitta*—the secretion of the ciliary body and the rodopsin, (*e*) *Sadhaka Pitta*—the hormones from the glands of internal secretion.

5 kinds of *Kapha* are the fluid materials which are essential for the functional capacity of the cell. Thus (*a*) *Ablambaka Kapha*—is the body water which carries the nutrient substances in solution to the cell and takes away the waste from the cell which also must be in solution. (*b*) *Kledaka Kapha*, the secretions from the mucous membranes lubricating the contents of the passages. (*c*) *Bodhaka Kapha* helps the taste buds of the tongue to ascertain the taste. This has been given special importance, as all substances, *viz.*, of the body constituents, of the food stuffs, the drugs, etc., are classified under 6 *Rasas* according to their taste. (*d*) *Schleshaka Kapha* unites all coarser elements of the body as bone to a bone, muscle to bone, skin with subcutaneous tissues, etc., (*e*) *Tarpaka Kapha*—the cerebrospinal fluid which sooths the brain.

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CASE NOTES

EOSINOPHILIC LUNG : REPORT OF FOUR CASES

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An eosinpohilia of 10 to 20 per cent is commonly seen in parasitic infections, skin diseases, allergic conditions and in some cases of asthma. An eosinophil count of more than 30 per cent (usually 50 to 80 per cent) associated with leucocytosis (usually from 15,000 to 50,000 per cmm.) may be the only finding and the patient may not complain of anything special but very often it is associated with interesting conditions. Brief clinical histories of few such cases are given below.

Case Report

Case 1—The first case which I saw was in 1933. A young man of 22 complained of cough (sometimes occurring in spasms), fever rising upto 101°F., pain on the right side of the chest and marked insomnia. Physical examination showed a dull percussion note on the right base, diminution of vocal fremitus, resonance and breath sounds, fine crepitations and a pleural rub. Skiagram showed both parenchymatous infiltration and pleural involvement of the right side. The picture was that of pulmonary tuberculosis but the sputum was persistently negative for tubercle bacilli. Total white blood corpuscles count of the patient varied from 28,000 to 55,000 per c.mm. with 80 per cent of eosinophils and once the white blood cell count rose to 1,09,000 suggesting a diagnosis of eosinophil leukaemia. Artificial pneumothorax, emetine injections, autohæmotherapy and symptomatic treatment were given during his three months stay in the hospital but to little relief. He left the hospital and as his main trouble was severe paroxysms of cough, I gave him one tablet of ephedrine hydrochloride. The paroxysmal cough was averted but he started collapsing with a feeble pulse of 140 per minute. He recovered after volatile stimulants,bandaging of the lower limbs, and raising the foot end of the bed. As the collapse was thought to be due to hypersensativeness to ephedrine he was given ephedrine in doses of 1/12 grain four hourly with a mixture containing iodide, bromide and belladona. He improved gradually, gained in weight, and took to his work. A second x-ray examination showed that his lung condition had completely cleared up and the total W.B.C. and eosinophils were markedly reduced.

Case 2—The second patient was a medical man. He complained of fever, loss of weight and cough, but he had a total white count of 30,000 per c.mm. and 60 per cent eosinophils. He was being treated as a case of tuberculosis. As the Wassermann reaction of his blood was reported to be++ he was worried at the prospect of a long antisyphilitic treatment. He left the hospital and he became alright after a few soamin and autovaccine injections. A few weeks later I found his W. R. to be ± and Kahn test completely negative and I told him that his W.R. test should be repeated before starting anti-syphilitic treatment. A couple of months later his W.R. was ± and stil two months later it was completely negative. His eosinophilia also markedly reduced. Soon after Col. Greval (1940) correlated the two conditions when he reported that W.R. becomes positive in cases of high eosinophilia and that it becomes negative as the eosinophils disappear. Greval calls it lecithinophilic eosinophilia. A natural corollary of this observation is that a blood film examination is necessary before a correct interpretation of Wassermann reaction can be given.

Case 3—My third case was a girl of 9 years who complained chronic cough, mild fever and anæmia. As her father had a positive history of syphilis, I examined her blood for Wassermann reaction and found it to be +++ but the Kahn test was completely negative. Her blood film showed apparently marked leucocutosis and 70 per cent eosinophils. I advised her soamin injections and she improved markedly.

Case 4—The fourth case was a boy of 12 years. He had cough, low fever, loss of weight, positive lung signs and a skiagram showed active infiltration of both the lungs. I examined the sputum and found occasional acid fast bacilli thus confirming the clinical diagnosis of tuberculosis. As there was a family history of syphilis the physician asked for a Wassermann reaction of blood and it was +++ but the Kahn test was completely negative. As I always examine a blood film in such cases I found 65 per cent eosinophilia with apparent leucocytosis. Now as I have not seen a case showing tubercle bacilli in sputum with high eosinophilia so far, I wanted to give the finding of tubercle bacilli in sputum a benefit of doubt. I asked for another specimen of sputum. It was completely negative for three consecutive days even after concentration methods. The boy was given a few injections of N.A.B. and he is now practically cured.

Discussion

As a pathologist I very often get sputum for examination for tubercle bacilli and if it is negative I always examine a smear after leishman's stain. This has revealed good many cases showing eosinophils in the sputum and subsequently of eosinophilia in blood and has thus saved the depressive feeling which comes on the patients and the relatives after a verdict of tuberculosis.

As we are getting familiar with this condition the number of cases showing this condition is increasing. In the month of June 1944 alone, I have reported high eosinophilia in about two dozen cases.

This condition has been given the name of eosinophilic lung by Frimodt Moller. The patient is usually an adult or a child. The main complaints are fever usually low but may be high, cough with mucoid or mucopurulent sputum which may be negligible, slight, or severe and spasmodic cough with loss of weight. Physical examination shows anæmia, signs of infiltration in the lungs, radiologically tuberculous type of infiltration (early or extensive), high leucocytic count with eosinophils of about more than 50 per cent and sometimes a positive Wassermann reaction but the Kahn test is negative. Tubercle bacilli are absent in sputum, which usually shows large number of eosinophils. The condition is practically cured by N.A.B. or other arsenic injections and auto-vaccines are helpful.

The other important condition associated with high eosinophilia is a positive Wassermann reaction and the cases which I have seen show a negative Kahn test. As a routine I always do a Kahn test with Wassermann reaction and any one test showing a positive results is considered to be the evidence of syphilitic infection. Since I have observed and Greval has reported the association of a positive Wassermann reaction with high eosinophilia, I have started examining a blood film in every case of positive W. R. with negative Kahn and if high eosinophilia is found, a positive W.R. is not regarded to be due to syphilis. There is one comforting feature and that is that for a positive W.R. whether it is due to syphilis or to eosinophilia the treatment is by arsenic injections.

The above observations do not mean that cases of high eosinophilia cannot suffer from syphilis. I have seen three

cases of high eosinophilia in which both W. R. and Kahn test were positive. So far I am not aware that Kahn test can become positive due to high eosinophilia, these cases have been considered to be syphilitic. It should also be understood that all cases of high eosinophilia may not give a positive W.R. In one of the cases reported by Treu both Wassermann and Kahn test were completely negative.

Tuberculosis, syphilis and good many other condition may be found to be associated with high eosinophilia and there is no reason to believe that eosinophilia confers immunity against certain conditions. In one case I found it to be associated with diabetes and albuminuria.

As regards the etiology nothing definite is known as yet. It appears to be some allergic condition which may be due to some kind of food, dust or bacterial infection. The useful effect of arsenic injection and auto-vaccine is suggestive that the condition is usually bacterial in origin. In one case the condition seemed to be aggravated during his residence in the compound of a Cotton Mill suggesting that cotton dust had somethink to do with his conditions, but it may be only a secondary aggravating factor. Whether these cases are completely cured or whether the disease becomes latent and produces relapse I leave for the future observers to decide.

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ACUTE BACILLARY DYSENTERY TREATED WITH SULPHAGUANIDINE

AMULYA CH. SENGUPTA, M.B., *Ranchi*

'Sulphaguanidine' (Sulphanilyl guanidine monohydrate) is the guanidine analogue of 'sulphapyridine'. It differs from other sulphonamides by their low absorbability from the intestinal tract when given by mouth. Nevertheless, it is fairly soluble in the intestinal contents, and tends to remain in the colon and to exert its bacteriostatic influence therein for a longer time. It is particularly effective against Gram-negative bacilli in the intestinal tract, including B. dysenteriæ and other organisms known to produce the disease of the intestinal tract.

Dosage in adults—2-4 tablets (0·5 gm. of each) to start with according to severity of the case and then 2-3 tablet every 4 hours during day and night until fæcal matter appears in the stool, and their number reduced to 4 or less per day. Then 1 tablet every 4 hours during the day only for at least 3 days. *In children*—½—1 tablet at a time every 4 hours to be continued in the same way as in the case of the adults.

Sulphaguanidine should not be continued for longer than 14 days in either adults or children.

Sufficient fluids and chlorides should be administered. An ample flow of urine is essential.

Precautions and Contra-indications—Our knowledge of the sensitivity to other sulphonamides, demands us to be very cautious in the administration of sulphaguanidine to patients who have previously suffered from any toxic reactions in the course of therapy with sulphonamides. Particular attention should always be paid to the urine. If both a heavy deposit of sulphaguanidine crystals and occult blood appear in the same urine for two successive days, the drug should be discontinued and fluids forced to wash the drug out of the intestinal and urinary tracts.

All other toxic manifestations associated with sulphonamides, such as hæmaturia, hæmolytic anæmia, leukopenia, anuria or conjunctivitis—may occur with sulphaguanidine. Drug rash and drug fever have been reported in several cases, disappearing with the discontinuance of the drug. Nicotinic acid is also of value in combating the toxic effects of sulphaguanidine.

CASE NOTES

(1) R. P., Hindu, male, 65 years, after a heavy dinner went down with a sharp attack of dysentery ushered in with moderate chill. For 2 days he passed nearly 35 to 40 stools a day with severe tenesmus and griping, temperature varying from 90°-101°F. His stool was examined and it was found to be a case of bacillary dysentery. Though recommended, sulphaguanidine was not available in the market till the 12th day of his illness. Meanwhile, due to the gravity of the case he was put on M. & B. 693 and anti-dysenteric serum which unfortunately did not improve him in the least. On the 12th day sulphaguanidine was first administered with a lot of diffidence as in such a late case, good results could hardly be hoped for. 48 hours after the exhibition of sulphaguanidine the stools for the first time began to decrease in number and during the next 48 hours remarkable improvement was noticed in the number of stools. On the 16th day it came down to 7 or 8 only in 24 hours. Simultaneously the griping and tenesmus disappeared and the general out-look of the patient greatly improved. Considering the advanced age of the patient no further sulphaguanidine could be pushed and the residual infection was treated symptomatically till the patient was declared cured on the 21st day. The patient, however, received subcutaneous saline and intravenous glucose to check dehydration and prostration.

Case 2—H. S., Hindu male, 36 years, of good built, got an attack of high fever (105°F) with some chill and rigor. This was followed in a few hours' time by copious diarrhœic motion with griping and tenesmus. From mid-night to about 8 a.m. he passed nearly 40 stools, the character of which had changed in a few hours' time to frank dysentery. The stool examination revealed it to be a case of bacillary dysentery and sulphaguanidine was started at once, 2 tablets initially, followed by the same dose every 4 hours. The tenesmus and griping were the first to be favourably affected, and then the frequency of stools, which dropped down to 10. During the next 24 hours, the fæcal matter appeared in the stool which showed mucus but no blood. On the 3rd day the patient had only two small semi-soft stools. On the 4th day he was put on slops and subsequently made a complete recovery.

Case 3—Ruma, Hindu, female child, 1 year, after a brief period of diarrhœa and indigestion was suddenly attacked with high fever and frequent motions (once in about every 20 minutes) of green and slimy character. Stool examination having shown it to be a case of bacillary dysentery she was given 1 tablet of sulphaguanidine with saccharum lactis at once, followed by 1/4 tablet of sulphaguanidine every 4 hours. In 16 hours' time the frequency of stools came down and fæcal matter appeared in the stool. The same dose of sulphaguanidine was maintained for 48 hours more, during which time the stool had practically become normal in character. In the next 2 days' time the child came round completely.*

*Read before the Scientific Section, III Bihar Provincial Medical Conference, Ranchi December, 1943.

JOURNAL OF THE
INDIAN MEDICAL ASSOCIATION
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INDIA, POPULATION AND HEALTH

Our country covers an area of 1,570,000 square miles. In area it is almost equal to Europe without Soviet Russia. In this vast subcontinent lives about 400,000,000 people. It is a land of villages where more than 70 per cent of the population depend on agriculture for a livelihood.

Recently this population has been one of the biggest targets of criticism among our so-called wellwishers. It has been advertised so frequently throughout the world that every time the backwardness of India is debated in the field of education, wealth, health, food, nutrition and industry, the same "teeming millions" are held responsible. Worst of it that even some of us are thinking along the same line. Would disease, pestilence, poverty and malnutrition disappear from our country like magic, if it were inhabited by a few million people only? Are the thinly populated Pacific Islands, the richest and healthiest spots on the surface of this globe? Population in the U.S.A. and Soviet Russia have not become a drawback in their progress. The U.S.S.R. has shown how quickly progress can be made even with a population of more than 180 millions (1937), increasing by 3 millions a year, consisting of more than 180 nationalities speaking about 150 languages or dialects[1]. Pendse whose article is published elsewhere in this issue rightly remarks, "The simple statement therefore that the Indian population since the first census in 1872 has been on the increase and that it has more than doubled leads us nowhere . . . . the population in all the European countries have doubled in the 19th century without any problem of overpopulation in its real sense."

Let us now consider the background of health and wealth of these 400 million people. In 1938, 6,685,120 persons died of dysentery, cholera, plague, small pox, respiratory diseases and fevers etc. A brief comparison of the chances and risks of life in India and England is made thus: (*a*) Birth rate per 1,000 in India 31·1, in England 15·5, (*b*) maternal mortality per 1,000 births in India 9, in England 1, (*c*) infant mortality (under 1 year) per 1,000 born in India 250, in England 72, (*d*) number living to reach the age of 10—in India 560, in England 890, (*e*) number living to reach the age of 15—in India 540, in England 833 (*f*) number living to reach the age of 50—in India 240, in England 747 and (*g*) number living to reach the age of 75—in India 40, in England 296.[2] The general expectation of life at birth is under 27 years as against 62 years in England. Of the 1,471 towns in British India, only 253 have protected water supplies. To serve the 400 million souls in India there are only 9,500 hospitals. 95,000 beds, 42,000 doctors and about 4,500 nurses. This gives one hospital or curative institution to every 163 square miles and to every 40,185 persons, one doctor per 9,000 of the population. The Government of India contributed only 3·4 per cent of the total revenue in 1938-1939 for public health as compared to 22·7 per cent contribution of the total revenue in United Kingdom during the same year. The average income per head is approximately 2½d. (1 d. = about 3½ pice) a day. With this income the people are naturally poor and "although India is an agricultural country, a large proportion of its population does not get enough food to eat."[3] Regarding the quality of diet one Director of Health for the province of Bengal recorded "The peasantry are in a very large proportion taking to a diet on which rats could not live for more than five weeks. Their vitality is so undermined by inadequate diet that they cannot stand the infection of foul diseases." In 1943, we witnessed one of the worst famines in this country.

With such a condition one cannot expect the poverty and disease to disappear unless the general economic conditions are changed. Pendse has enumerated some causes of poverty in our people which should receive our careful consideration. On the other hand, is it possible to control the birth rate of such a population by any artificial means? From a table of comparative pre-war costs of contraceptive given by Pillay[4], we find that cheap and safer contraceptive costs 4 annas, a sum almost double the average income per head a day of our people. Unless a cheaper material is found, this question has to be dropped without discussing the possibility and desirability of universal application of this remedy to our people. In our opinion this method to control the birth rate will be highly detrimental at present without attempting to improve on the appalling health conditions. The population of our country is increasing by about 6 million a year and we are told we are living more and more beyond our food income. If the health and food conditions improve will the birth rate increase? Inspite of ample supply of means of subsistence and preventive medicine there has not been a continuous increase of population in Europe. In our country there is lack of both. Inspite of the increase in population there has been hardly any attempt to increase the food production on a scientific basis. We have shown[5] our meagre production of rice and wheat per acre in comparison to Japan and China. Wider application of scientific knowledge to agriculture and reclamation of cultivable waste land can surely meet this food deficit. The fear of overpopulation pressing upon the food production seems to be doubtful. The gradual rise of standard of living by industrialisation and greater popular welfare will check the birth rate as in European countries.

After going through 5 years of worst war time conditions with flood, famine and epidemics, we hear of innumerable Post-War Planning Committees of Government of India, to raise the standard of living in this country. Among the unofficial organisations, the "Bombay Plan" aims to double the standard of life for the whole of India within 15 years. Keen foreign observers like Prof. A. V. Hill says[6] "India is ripe for a great technological development of all her resources. I can see little hope for India of greater prosperity apart from going with the stream of modern life and seeking prosperity in that kind of development". Let no one suppose that with industrial growth, the misery of our people will vanish. *Lancet*[7] draws attention

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to the painful experience of industrial revolution in England which started almost a century ago. In agriculture, left to itself without planning and state control it "caused extreme misery in the midst of prosperity . . . . .with the creation of a serf class divorced from an interest in land". In industry "the factory system created a mass of underfed, underpaid men and women and even drew children into its slavery." If we imitate and begin where England started a century ago, we will be faced with the same fate. Let this lesson be borne in mind by the planning committees. India's population should not be regarded as a problem, because we think with the development of industry and agriculture, which are still primitive, there will be enough for all. There is no chance of increase in birth rate if the preventable diseases are eradicated. On the contrary with the rise of standard of living and other amenities of life, there is a possibility of a check on the birth rate.

VISIT OF FOREIGN MEDICAL EXPERTS

The Foreign Medical Experts' Committee which recently toured this country, we are told, visited to give their opinion on the various health problems and discuss the proposals of the Health Survey & Development Committee under Sir Joseph Bhore. We do not know if the Bhore Committee has submitted their report or it is at a stage at which it can be presented to the Foreign Experts' Committee. The Bhore Committee toured the country to enable it to make the preliminary investigations. The Foreign Experts' Committee also toured the country to make their impressions. We do not know how the Foreign Experts' Committee in this hurricane tour could possibly form a correct idea about the need and requirements of this country. We cannot anticipate what their recommendations would be but from what have been given out during their tour, press reports and the leading article of *Bombay Chronicle* of 27th November, 1944, we understand that they are thinking of establishing a Central Research Institute at Delhi. Earlier the Director General I.M.S. speaking on March 17, 1944 at the Founder's Day Celebrations of the Lady Hardinge Medical College for Women gave a hint of starting an "Indian Johns Hopkins" in New Delhi. Some years ago, another proposal to centralise research at Dehra Dun was advocated. At that time the Government called a conference in which representatives of the medical profession and the Indian Medical Association met at Simla. This conference did not recommend the idea on the ground that research institutes should not be divorced from medical institutions where medical cases are available and centralisation of research should not be done for administrative reasons only. It is advisable to foster the growth of research in the already existing institutions in the provincial cities. We hope before starting a Central Research Institute at New Delhi under official patronage and sunshine, the medical profession will be consulted. No doubt research requires official help and recognition but it also requires freedom from too much official interference and influences to thrive. There is no doubt that there is paucity of medical research in medical colleges and other teaching hospitals in this ountry, for which some members of the Foreign Experts' Committee expressed their concern. We have drawn attention to this fact in these columns many times before. The reasons are mainly financial and consequently lack of opportunity of medical students and graduates to imbibe research spirit. Moreover, the policy of appointments for administrative reasons only in teaching hospitals should be replaced by research considerations. Before the World War II, the Medical Research Department of the Government of India used to distribute about 14 lakhs of rupees a year on medical research in India. If the grants to the School of Tropical Medicine, Calcutta, which until a few years ago used to be mainly staffed by British I.M.S. officers, are excluded, then not even 3 per cent of this annual disbursement was used to be allocated for research in medical colleges and teaching hospitals in India. No doubt medical research has been frightfully starved in these institutions. And for paucity of research due to such a cause, let the country not be saddled with the "'import" of high salaried "research men" from abroad in the proposed Central Research Institute at New Delhi.

As regards the delegation itself, it includes broad-minded and internationally famous persons like Professor Ryle, Dr. Sigerist and Dr. Mountin. But if we are to derive any benefit of their knowledge and experience, they must be given enough time and opportunity to study the problem of health and medical education in India, a vast subject affecting the fate of 400 millions. On the other hand the Bhore Committee should send a deputation of its members or others to study conditions in Sweden, England, Russia and America, to find out for themselves what health problems were prevalent in those countries before and how they were tackled and to report the best means of grappling with the terrible conditions of public health with which we are faced to-day. If the Government is serious about these state of affairs, it should not resort to simple whitewashing or a facesaving show.

Recently we are receiving delegations, committees and experts in large numbers. We do not know when this is going to stop. We confess we are not much enamoured with them. We had many committees before like Labour Commission, Royal Agricultural Commission, and we also know where their recommendations are lying. What we want is a more vigorous action.

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P. B. MUKERJI,
Hony. General Secretary, I.M.A.

CURRENT MEDICAL LITERATURE

Preoperative and Postoperative Care for the Bad-Risk Patient

Dennis (*Minnesota Med.*, **27**:538, 1944) from the Surgical Service at the University of Minesota Hospitals in dealing with measures employed in the care of the poor-risk patient writes that the causes of the debiliated states in such patients are roughly: (1) dehydration, (2) malnutrition, (3) starvation, whether due to lack of food or to increased metabolism, (4) prolonged plasma loss with or without whole blood loss, (5) prolonged infection or (6) any combination of the above. The specific diseases which may contribute to these factors are represented by: (1) cancer of the stomach or colon with ulceration, (2) pyloric obstruction, whether benign or malignant, (3) chronic bowel obstruction, (4) chronic ulcerative colitis, (5) prolonged infections such as osteomyelitis and Meleney ulcer, (6) the later stages of extensive surface burns, (7) hyperthyroidism and (8) a host of less common ailments. Diabetic, cardiac and renal complications are possible additional factors.

Preoperative care: *Water balance*—Many of these poor-risk patients come with clinical dehydration and most of them are 5 to 7 per cent underweight. Severe dehydration is well treated by administration of 5 per cent of the body weight of fluids parenterally, one-half of this being 0·9 per cent NaCl. As a check on the states of hydration from day to day, Coller has shown that daily weighing of the patient is an invaluable aid, specially in patients in whom parenteral feeding is being employed. Gains of 5 per cent above the usual level are associated ordinarily with clinical œdema and gains of more than 2 or 3 per cent imply impending œdema and dictate caution in administration of further fluids. *Salt balance*—Improper sodium chloride administration to poor-risk patients may prove as readily fatal as the underlying disease itself. A marked low level of plasma chloride may lead to marked and even fatal drops in blood pressure which may respond extremely poorly to transfusion. For those patients who must be supplied other than by mouth, Coller has devised a very simple rule to determine the amount of sodium chloride which must be given to return the blood level to the normal level of 560 mgm. per 100 c.c. of plasma: "for each 100 mgm. that the plasma chloride level needs to be raised to reach the normal, the patient should be given 0·5 gms of salt per kilogram of body weight." When return of the blood chloride level to normal has been accomplished maintenance may be parenteral, when necessary and is usually easily accomplished by administration of 5 to 6 gms. daily, with extra allowance at the rate of 5 gms. per litre for loss due to vomiting, diarrhœa, drainage or gross sweating. The chloride in the urine is easily determined by the Van Slyke titration, and the aim is to keep the daily output between 2 and 7 gms. which assures a safe margin from either over- or under-dosage. *Acidosis and alkalosis.*—The patient may come in a state of marked acidosis or alkalosis but usually it is found that if adequate salt and water are given and an adequate output of urine is obtained the situation will be overcome without resorting to other measures. *Caloric requirements—oral route.* Many of these patients, specially those with duodenal ulcer or gastric cancer cannot be fed by mouth because such diets as the first stage Sippy are persistently vomited out. Certain of these patients could be well fed if an inlying nasal gastric tube are used to introduce a liquid formula, thus avoiding entrance into the stomach of several ounces of liquid at a time often with large amounts of simultaneously swallowed air. Varco has developed liquid diets, high in protein and carbohydrate and very low in fat content (whole egg—6, egg white—2, skimmed milk-powder—4 oz., lactose—300 gms., skim milk—1,000 gms.; with total of 2,446 calories). He bases the duration of such preparation on the proportion of the body weight the patient has lost since the onset of illness, using 5 days if the loss has been 5 to 10 per cent of the body weight, 10—12 days if it has been 10 to 20 per cent and 3 weeks if it has been 25 and 30 per cent. An adequate vitamin intake is also provided with the diet. *Caloric requirements—parenteral route.* Those patients who genuinely cannot be prepared by the oral route present a very serious problem. The author suggests the use of 20 per cent glucose solution intravenously, given no faster than 3 c.c. per minute. It will take approximately 6 hours to administer 1,000 c.c. of 20 per cent glucose solution at the rate. The needle must therefore be placed, away from the elbow preferably in the mid portion of the forearm, so that easy movement is possible. By this means it is feasible to get 1,200 to 1600 calories daily. This may be supplement by subcutaneous injection of 5 per cent glucose with or without salt leading to the supply of 200 to 300 additional calories. 200 to 300 mgm. of cevitamic acid, 20 mgm. of thiamine are usually added to the infusion. These patients suffer from protein starvation and human plasma thus far is the only agent by which this may be regularly and safety accomplished and the minimum daily requirement is 300 to 400 c.c. *Use of suction*—At operation these patients regularly have nasal gastric suction tube in place and nasal suction is ordinarily retained about 48 hours or until abdominal sounds, as heard with the stethoscope, have returned to normal or the patient has passed gas by rectum. *Prevention of anuria*—Postoperative anuria can be best prevented by establishment of adequate nutrition preoperatively and by induction of a reasonable driuresis in the few hours just prior to operation by intravenous injection of a litre of 10 per cent glucose solution and during the day of operation parenteral administration of 3,000 c.c. of fluids containing 5 gms. of sodium chloride. Judicious use of mercurial diuretic may be necessary.

Postoperative care. *General care*—The employment of the steep Trendelenburg position in the first 12 to 18 hours to stabilize circulation and to avoid aspiration of secretion, the use of the Muller suction apparatus to keep the mouth and pharynx dry in the first few hours until reflexes are normal, frequent turning of the patient, hyperventilation, encouragement to cough, the elevation of the foot of the bed to 6 inches and frequent movement of the arm and legs to prevent stasis in the great veins and to lessen the incidence of thrombosis and embolism are some of the general postoperative measures to be adopted. *Fluids and salt.* During the day until normal ailments has been established a total of about 3000 c.c. of fluids are administered daily of which 1500 c.c. of 10 per cent glucose are given intravenously. Careful day-to-day checks of body weight serves as a guide to warn against excessive fluid administration. *Inlying catheter.* For patients in the older age group with mild prostatism who cannot void spontaneously in the immediate postoperative period inlying Foley catheters are useful for the first 3 or 4 days. Administration of half a gram of sodium sulphadiazine in 100 c.c. of normal saline solution twice daily is a helpful prophylaxis against urinary tract infection. *Feeding.* Following removal of the nasal tube the patient is kept a day on clear fluids, a day on full liquids, a day on soft diet and finally passes to a general diet. *Early ambulation.* Good preoperative preparation and careful silk closure seem to us to

justify getting these people out of bed seven days after such operation as gatstric or colic resection and sending them home nine days after operation. The author concludes by saying that the time spent in careful preoperative preparation not only cuts the time till dismissal but cuts the severity of reaction to operation and the mortality as well.

BLOOD DISORDERS IN RELATION TO PREGNANCY

PINEY (*Post Graduate M. J.*, **20**:170, 1944) stresses on the fact that our knowledge of the blood in normal and abnormal pregnancy is woefully deficient and a great deal more observation is needed to fill the large gaps in our knowledge.

PHYSIOLOGICAL CHANGES. The *blood volume* is increased very considerably beginning about the third month and it is estimated that at term the increase of the blood volume is 23 per cent and that of the plasma 25, the blood volume returning to normal within a few weeks of delibery. This is why the loss of blood is so will tolerated by pregnant and parturient women. The *luicocyte count* increases steadily throughout pregnancy, mainly by addition to the number of neutrophiles, most of which are normal mature polymorphs; but in the last weeks there is some increase of less mature forms with unlobed nucleus, the staff cells of Schilling. During labour, the number of leucocytes rises steeply often reaching 35,000 per c.mm. This is only transitory and in the abscence of complications the count returns to normal by the end of the puerperium. The *sedimentation rate* is increased from the 3rd month onwards. In infective conditions of any considerable degree of severity there will be not only increase of neutrophiles, with some more or less immature forms but also some cells showing degenerative changes such as vacuolation of the cytoplasm, clumping of the granules and nuclear pyknosis. On the other hand leucocytosis of normal pregnancy is produced entirely by cells which are normal in structure. The need for care is further shown by the fact that leucocytosis occurs after any hæmorrhage, but, if the bleeding is on the surface, the increase of white cells is only slight, whereas, if it is in contact with the peritoneum, dura, pleura or a joint surface, the increase is much greater.

ANAEMIA IN PREGNANCY. It is probably true to say that no anæmia is truly *physiological* but anæmia of such slight degree that it does not interfere with health is very common in pregnant woman. It is a normocytic hypochromic anæmia due to deficiency in iron caused by (1) initially defective stores of iron in the body (sometimes for dietetic reasons) and (2) inadequate absorption from the stomach on account of the hypochlorhydria that is commonly present in pregnant women. *Hypochromic anaemia of pregnancy.* There is no real difference of kind but only of intensity, between this form of anæmia and the 'physiological' anæmia discussed above. The increased demand for iron, both by the physiologically hydræmic mother and by the fœtus, cannot be fully met from the stores in the body, which may start in a depleted state, and which are not replenished, either because of low absorption, defective diet, a sepsis, or all these factors. *Megalocytic hyperchromic anæmia of pregnancy.* The blood picture has the general characters of idiopathic pernicious anæmia but the following characteristic features differentiate the two conditions: (1) Achlorhydria which is practically constant in cryptogenetic pernicious anæmia is not so in the pernicious anæmia of pregnancy; indeed, it is less common than in pregnant woman who is suffering from chronic hypochromic anæmia. (2) Damage to the nervous system does not develop. (3) When recovery has taken place spontaneous relapses do not occur, even if all treatment is stopped. Treatment, during pregnancy, consists of injections of liver extract but the response is often not prompt when the patient may need one or more blood transfusions to tide over the pregnancy and delivery but the liver injections must be continued during the whole time. It is often being stated that pernicious anæmia of pregnancy is cured spontaneously after delivery; but this is far from being invariable and the treatment should be continued with as much energy after parturition as before, until the blood is restored to normal. The reason for relatively low response to liver is not known. It may be that in it we have a so-called dimorphic anæmia, in which there is (or has been) deficiency of hæmopoietic factor and also of iron. In later stages of liver treatment the red corpascles will continue to rise, but the hæmoglobin lags behind and the color index falls. No harm is done by administering iron in the later stages of treatment in all cases, but, for scientific accuracy, it is better to have fairly frequently blood counts, so that the appropriate time for giving iron can be found. *Tropical megalocytic anæmia* presents a blood picture similar to that of pernicious anæmia but unlike that disease, the origin of the malady is mainly dietetic: the deficiency is one of extrinsic factor. Clearly, treatment must be based on an knowledge of the etiology of the condition: extrinsic factor must be supplied inorder to combat the hyperchronic anæmia and iron must also be supplied. Crude liver extracts are better than highly purified ones. The importance of a properly balanced diet is shown by the fact that, if a remission is induced by liver injection or by Marmite, together with iron, no relapse occurs if the patient is supplied with an ordinary mixed diet.

PURPURA. A few purpuric spots may develop in any pregnant woman but in cases of hyperemesis and eclampsia moderately severe purpura is not uncommon. This is not associated with reduction of number of platelets. But the coexistencce of pregnancy and purpura hæmorrhagica (thrombo-cytopenic purpura) is a grave condition. Early therapeutic abortion may save most of the maternal lives. It abortion is not followed by rapid improvement, transfurious may be necessary and even splenectomy can be done without much risk. It abortion is refused, the treatment must be continuous (intramascular injections of small amounts of blood, liver extracts) and carefully controlled by frequent platelet counts. Means must always be at hand for transfusion at short notice and even for splenectomy. To avoid excessive hæmorrhage during labour injections of 10 minims of adrenaline are advocated but transfusion may be imperative.

HAEMOLYTIC CONDITIONS DURING PREGNANCY. There are no forms of essentially hæmolytic anæmia peculiar to pregnancy but such a state may be present before pregnancy or may develop during it. A woman suffering from *acholuric family jaundice* does not appear to be more likely to come to harm during pregnancy than at any other time. A hæmolytic crisis may develop and the problem is then a difficult one because abortion will not stop the hæmolytic process and splenectomy is extremely dangerous during acute stage of the disease. It is probably best to do nothing, except keep the patient in bed until recovery commences. Transfusion is very likely to evoke extreme reactions which may prove fatal. Pregnancy may occur in sufferers from rare syndrome of *nocturnal hæmoglobinuria.* If the trouble persists or gets aggravated transfusions may be tried. *Lederer's anæmia* seems to occur, though very rarely, more frequently in pregnant women than in others. The cause is unknown, but the clinical features are those of an acute infection, the blood shows anæmia of hæmolytic type and high leucocytosis. Evacuation of the uterus does not do any good and prompt transfusion, repeated if necessary, will obviate any danger to life.

Careful matching of the blood is necessary because there is a great tendency to autoagglutination.

LEUKAEMIAS. If it is of acute type spontaneous abortion is almost certain to occur but if chronic the pregnancy may proceed normally. There is no reason for terminating pregnancy because the children of leukæmic mothers do not appear to be affected by the disease. There is some danger of excessive bleeding during delivery; prompt transfusion will, almost certainly, provent a fatal result. As x-ray treatment is not advisable during pregnancy the malady may progress unchecked, but arsenic, given by mouth, will usually keep the disease within bounds until after delivery, when if necessary, irradiation can be started again.

THE CHOICE AND USE OF SULPHONAMIDE DRUGS

WHITBY (*Practitioner*, **153**:94, 1944) writes that the choice of a sulphonamide drug depends upon the range of activity of the compound, the solubility, the toxicity and other pharmacological facts, as well as upon what is available. Certain infections or certain sites demand particular drugs, if the best results are to be obtained.

GENERAL THERAPEUTIC PRINCIPLES. The parent substance of the whole group sulphanilamide or *p*-aminobenzene sulphonamide which has an obvious chemical resemblance to *p*-aminobenzoic acid which again is an essential foodstuff of many common bacteria. The general idea is that if the sulphonamide be presented to the bacteria in sufficient concentration, the organism seizes upon it in preference to *p*-aminobenzoic acid with the result that its whole metbaolism is retarded with this attractive but unsatisfying foodstuff and it is unable to multiply at its usual rapid rate. It is an axiom that sulphanilamides are specific to those bacteria that utilize *p*-aminobenzoic acid; they are not specific for every pyrexia of unknown origin and are thus inactive in the common everyday virus diseases, though they are all not infrequently used in this respect. It is obvious that substitution for *p*-aminobenzoic acid can only occur when the sulphanamide is presented in *sufficient concentration* and *continuously*. A clinical improvement should occur in seven days or, at most, ten days. If there is no obvious effect at the end of this time, using adequate and regular doses, the inference is that infection is insensitive to the drug employed. It is wellknown that the drugs are highly sensitive to the medium in which they are called upon to act. Any substance, which contains or resembles *p*-aminobenzoic acid is antagonistic to sulphonamide and the most important inhibitory substance is pus; others which intrude from time to time are the procaine derivatives and eusol (sodium hypochlorite). One of the mistakes frequently made, when using sulphonamide drugs is to pursue the treatment when the lesion has gone from the stage of hyperæmia to that of active suppuration.

METHOD OF ADMINISTRATION. The *oral route* is the one of choice; it ensures a steady concentration in the blood, special fluid, spinal fluid or serous exudate and, whenever possible, should be used in preference to the parenteral injection. The *parenteral route* is used for the first dose in acute and dangerous infections, in order to obtain an immediate effective concentration or in cases in which the oral route is prohibited. The soluble preparations available are the sodium salts of sulphapyridine, sulphathiazole and sulphadiazine or a saturated solution (0·8 per cent) of sulphanilamide in physiological saline. The sodium salts are highly alkaline solution dispensed as 1 gm. in 3 c.cm.; these need to be diluted at least threefold before injection. They may be given intramuscularly or preferably intravenously. Intrathecal and subcutaneous should never be employed. Sulphanilamide solution (0·8 per cent) can be given per rectum. *Local applications* are made to the skin surface, to tissue wounds, to burned areas and to serous cavities. Applications are to be made with the powdered drug, with microcrystalline suspension, with a solution or with a paste or cream.

DOSAGE. The accompanying table, quoted from the Medical Research Council Memorandum No. 10 gives a scale of dosage, for all common sulphonamides, applicable to various clinical grade of severity.

SEVERE INFECTIONS (ENDANGERING LIFE)

	Adults	*Children*		
Initial dose	2-4 gm. intravenously 1·5 gm. by mouth	Age 0—3 0·5 gm. intravenously 0·5 gm. by mouth	Age 4—10 1 gm. intravenously 0·75 gm. by mouth	Age 11—15 1-2 gm. intravenously 1 gm. by mouth
Followed by:				
1st period, 2—3 days ..	1·5 gm. 4-hourly	0·5 gm. 4-hourly	0·75 gm, 4-hourly	1 gm. 4-hourly
2nd period, 2 days (approximately two-thirds of dose of 1st period) ..	1 gm. 4-hourly	0·5 gm. 6-hourly	0·75 gm. 6-hourly	1 gm. 6-hourly
3rd period, 2 days (approximately one-third of dose of 1st period) ..	1 gm. 6-hourly	0·25 gm. 6-hourly	0·5 gm. 6-hourly	0·5 gm. 6-hourly

MILDER OR "MODERATE" INFECTIONS

	Adults	*Children*		
Initial dose	2 gm.	Age 0—3 0·5 gm.	Age 4—10 0·75 gm.	Age 11—15 1 gm.
Followed by:				
1st period, 2 days (unless otherwise stated) ..	1 gm. 4-hourly	0·5 gm. 4-hourly for 12-25 hours	0·5 gm. 4-hourly	0·75 gm. 4-hourly
2nd period, 2 days (unless otherwise stated) ..	1 gm. 6-hourly	0·5 gm. 6-hourly for 3-4 days	0·5 gm. 6-hourly	0·75 gm. 6-hourly
3rd period, 2 days ..	1 gm. 8-hourly		0·25 gm. 6-hourly	0·5 gm. 6-hourly

The duration of a course is normally 6-7 days, and it should rarely be prolonged beyond the seventh day.

The doses given in table should maintain *blood stream concentration* at the following levels:

	Severe	*Moderate*
	mgm. per cent	mgm. per cent
Sulphanilamide ..	.. 7—10	4—6
Sulphapyridine ..	.. 7—10	4—6
Sulphathiazole ..	.. 6—7	3—5
Sulphadiazine ..	.. 10—15	6—10

INDIVIDUAL DISEASES. *Pneumonia*—For the pneumococcal and staphylococcal forms of this disease sulphathiazole is probably the best choice. Sulphadiazine, sulphamezathine and sulphapyridine are equally good in pneumococcal cases, whilst sulphadiazine is the only member of the group with a proved activity against *B. Friedlanderi* infection. Sulphanilamide is ineffective. *Meningococcal and gonococcal infections*—Sulphathiazole or sulphadiazine are probably best although sulphapyridine is almost as effective. With gonorrhœa the object is to obtain the minimum amount of subjective discomfort with the maximum effect. Ophthalmia responds as well to parenteral or oral treatment as to local application. Meningococcal infections due to pneumococcus, staphylococcus or H. *Influenzæ* are best treated with sulphathiazole in full dosage. *Intestinal infections*—For bacillary dystentary, particularly of the Flexner type, sulphaguanidine is the drug of choice. The dosage is large. For an adult, 9 to 12 gm daily for first three days, followed by 6 gm. daily for four or five days. Succinyl sulphathiazole is said to be more active than sulphaguanidine against some of the other bacillary forms of dysentery, especially the Sonne infections; it is absorbed even less than sulphaguanidine. Bacillary dysentery will also respond to sulphapyridine, sulphathiazole and sulphadiazine, but not to sulphanilamide. *Urinary infections*—Owing to the concentrating action of the kidney, the amount of drug found in urine is about 50 times that found in the blood. Hence, the dose can be relatively small (see moderate infections, *vide* Table) and it is preferable to use either sulphanilamide or sulphacetamide, which does not tend to form calculi. For resistant cases, sulphamezathine is proabably best or alternatively, sulphathiazole 0·5 gm. twice daily over a prolonged peiod. With these two drugs and adequate urinary output must be secured, and alkalinization is an advantage.

LOCAL APPLICATIONS. *Skin infections*—Sulphathiazole is most commonly used for local application in skin infections, in that the majority have a staphylococcal basis. A cream or paste containing 5 per cent of the drug is recommended. Sensitization either to the drug or to light may follow prolonged applications which should be limited to a period of five, or at most seven days. *Serous cavities*—Sulphonamide therapy may be used to treat established peritonitis or as a prophylactic. All preparations should be sterilized. On account of its solubility, sulphanilamide is the compound of choice, but a mixture of 3 parts sulphanilamide and 1 part sulphathiazole gives a more sustained action. An alternative, if obtainable, is the microcrystalline suspension (20 per cent) of sulphathiazole or sulphadiazine. Sulphapyridine and ordinary sulphadiazine are unsuitable, as they tend to cake. *Tissue wounds*—Topical application to wounds which have not been dealt with surgically has little action, but is nevertheless employed with a view to obtaining some prophylaxis. This must be supplemented by another application at the time of debridement. As in the case of the serious cavities, sulphanilamide powder is most widely used because it quickly attains a high local concentration and is in fact the least harmful to tissue; it is sometimes mixed with proflavine (99 sulphanilamide; 1 proflavine) or with penicillin. The sulphanilamide sulphathiazole mixture and the microcrystalline suspension of sulphathiazole or sulphadiazine may also be used as in the case of the serious cavities. Sulphathiazole should not be applied to the injured brain surface, as it leads to epileptiform convulsions in many cases. Indeed no sulphonamide should be left in contact with injured nervous tissue, particularly big nerves. for long periods. All local applications to tissue must kept moist. On account of the relative inefficiency of topical applications they should be supplemented by oral prophylactic administration whenever the wound is of the type likely to become seriously infected. *Burns*—Here again sulphanilamide is the usual choice, in the form of a cream or paste from 3 to 5 per cent, in strength. A suitable cream, recommended by the Glasgow School is: Cetyal trimethyl ammonium bromide—1 gm., sulphanilamide—3 gm., castor oil—25 gm., beeswax—1·8 gm., wool fat—1·8 gm., cetyl alcohol—5 gm., glycerin—10 gm. and water—52·4 gm.

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NOTES AND NEWS

RATIONING OF GOVERNMENT QUININE AMPOULES

The following circular letter has been addressed on 11-1-45 to all registered medical practitioners, Calcutta, by Major M. Jafar, I.M.S., Director of Public Health, Bengal, Provincial Quinine Rationing Authority:

(1) Registered medical practioners in Calcuta only are hereby invited to apply to the undersigned for permit to purchase Government Quinine Bihydrochloride Ampoules (6 grs. in 2 c.c) for use in their practices.

(2) Applications are to be made on the prescribed form which can be obtained from the following authorised stockists of Government Quinine Ampoules:—Messrs. Shafi & Co., Wholesale Chemists and Druggists, 79, Colootola Street, Calcutta. Messrs. M. Bhattacharya & Co., Allopathic Store, 80, Clive Street, Calcutta. Messrs. Butto Kristo Paul & Co. Ltd., 1 & 3, Bonfields Lane, Calcutta. Messrs. Frank Ross & Co. Ltd., 15|7, Chowringhee, Calcutta. Messrs. Amin Ismail, 80, Colootola Street, Calcutta.

(3) On receipt of applications the undersigned will issue a permit to the applicant for the number of ampoules sanctioned, along with a *Quinine Ampoule Ration Book.*

(4) On presentation of the Permit and the Ration Book to any of the above stockists, ampoules to the sactioned amount can be purchased at the controlled rate of Rs. 1|14|- per box of six ampoules. All entries required in the Ration Book must be made and certified by the holder.

(5) To obtain replenishments or supplementary issues, the procedure laid down in (2) and (3) above will be followed.

DR. JIVRAJ MEHTA APPRECIATION FUND

Dr. Jivraj N. Mehta, the Dean of the K. E. M. Hospital and the Seth Gordhandas Sunderdas Medical College and Dr. R. E. Dadachanji, the Assistant Dean of these institutions retired from service some time ago.

It is now proposed to present them with farewell addresses.

At the same time it is felt by the students and the staff of these institutions as also by the friends and admirers of Dr. Jivraj N. Mehta that a Dr. Jivraj Mehta Appreciation Fund be started to commemorate his unique services to these institutions.

Dr. Jivraj Mehta guided the destinies of these institutions from their inception and brought them to their present standard of efficiency and usefulness and proved himself to be a great Organiser and a disciplinarian.

A Committee with Dr. R. N. Cooper as President has been appointed to collect contributions to the Appreciation Fund.

The final shape which this Fund will take will depend upon the amount collected. It can only be pointed out at this stage that the College and the Hospital are in sore need of a first rate Research Laboratory, a Blood-Bank, a College Hall and attractive entrance scholarships.

INDIAN RADIOLOGICAL ASSOCIATION

Physicians practising Radiology in any part of India are requested to send in their names, address, qualifications, hospitals or clinics to which they are attached, and other relevant information to the Secretary, Indian Radiological Association, 4, Cooper Street, Calcutta, so that a role might be prepared by the Indian Radiological Association. This is a preliminary step of a scheme which the Indian Radiological Association has, for advancement of radiological practice in India.

U. P. MEDICAL COUNCIL

Extracts from minutes of meeting held on 9-12-44:

Government notifications announcing the renomination of Major-General H. C. Buckley, C.S.I., M.D., F.R.C.S., I.M.S., and the nomination of Major M. R. Sinclair, O.B.E., B.CH., L.R.C.P., M.R.C.S., I.M.S., as members of the Council, and Medical Council notifications announcing the re-election of Drs. Chaudhuri Hardeo Singh Verma, L.M.P., and Prem Shanker, Verma, L.M.P., P.S.M.S., and the election of Rai Bahadur Dr. B. N. Vyas, M.B., F.S.M.F., and Rai Bahadur Dr. Rameshwar Singh, L.M.S., were read and recorded.

Resolved that the names of Dr. Miss Bhagwan Devi (Dube), L.M.P., and Dr. Har Datt Pant, L.M.P., be restored.

Resolved that the name of Dr. Jotindra Mohan Datt Gupta, M.B. (CAL.), be restored.

The case against Dr. Jagdis Pershad was considered and it was unanimously decided that his name be erased from the List of Medical Practitioners.

The Council placed on record its deep appreciation of the valuable services rendered to this Council by Capt. S. K. Chaudhri, B.A., M.B., M.B.E., and Capt. R. N. Bose, I.M.S.

Resolved that this Council considers that it is the inherent right of a Registered Medical Practitioner to supply medicines for relief of pain and suffering and as the imposition of a Purchaser's Licence is an interference with this right, this Council therefore recommends to the Government of India, through the Provincial Government, to remove this disability.

INDIAN DRUGS RESEARCH ASSOCIATION, POONA

The research in the field of drugs necessitates an adequate knowledge of various physical and natural sciences, like chemistry, botany, pharmacology, medicine and others. With the advance of modern sciences and the analytical method of study, it is impossible for one individual to be a master of all and a team-work with proper co-ordination is extremely essential to make any real progress in the field. The realisation of these facts has already created many co-ordinated research organisations in other countries advanced in physical sciences, and the same is responsible to bring the Indian Drugs Research Association into existence.

The amount of the memberships and subscriptions can never cope with the cost of such a work. As such financial support to the work of the Association is needed. The aim of the body is purely scientific and pure work many a time leads to some applications in the immense spheres of industries, and it is hoped that the industrialist will realise the necessity to maintain such pure work out of their own profits.

All communications and inquiries are to be addressed to Dr. G. S. Pendse, D.O.M.S., Hony. General Secretary, The I. D. R. A., 631|27, Sadashiv Peth, Poona 2.

(*Continued from page 112*)

(Editorial, *Lancet*, Vol. II, page 348, 1944). We have recently received a pamphlet on "Penicillin" from the Penicillin Control Board, Government of India, but its function is now mainly distribution of "imported" penicillin.

We have outlined above the method of control of drugs and penicillin. If they are emulated, great progress can be achieved in the supply of pure drugs. No half-hearted or scrappy legislation can fight the black trade of adulterated drugs. Our readers may be assured that the *Journal* will discontinue any advertisement of a new drug whose claims are questioned by clinical trials, bacteriological and pathological reports or the standard of strength and potency as found out by a Drug Standardisation Laboratory.—EDITOR, *J. Indian M. A.*

REVIEWS

REPORT OF THE SCIENTIFIC ADVISORY BOARD OF THE INDIAN RESEARCH FUND ASSOCIATION FOR THE YEAR, 1943—Published by Secretariat, New Delhi. Price One Rupee.

A totalitarian warfare—that is how the Germans have described the present gigantic conflict. It is so, indeed, because in its wake comes the indescribable suffering of the civilian population but for whom no military powers can ever hope to achieve success. Malnutrition, starvation and epidemics account for more civilian casualties than those from bombing. Food and nutrition, and medical help including preventive measures against epidemics are problems for the civilian administration and are as essential as the question of military supplies and the comforts of the fighting forces. The problems are more acute in our country where the mass is un-educated and the economical condition is far below the average standard of any other part of the world. Even in peace-time epidemics of cholera, small-pox, and plague create havocs while malaria remains as an ever-increasing menace. With the war coming to the border of India we have come to realise the enormous task that lies before us and that requires a co-ordinated effort of men in all spheres of life. Needs of scientific men at this juncture are increased thousandfold and and the Scientific Advisory Board is doing their part as ably proved by the publication of the Report of their works during the year, 1943.

Works on Cholera both from the public health point and therapeutic consideration are assuring and we expect in the very near future the specific remedy for cholera would be found out and the appalling mortality from the disease checked effectively. More stress should, however, be placed on the prophylactic measures among masses, which, we find, are being attempted in some areas of Madras.

Nutritional researches are being carried out on a grand scale but the practical achievements are not up to satisfaction. Deficiency of vitamin A is a very common finding in Bengal and attempts should be made to combat the same by adding suitable food-stuff to our rationed food-articles. Measures for correcting vitamin deficiency were made in the United Kingdom by adding vitamins A and D in sufficient quantities to the quota of margarine which was a substitute for butter. There is no use in dragging the question of defective nutrition in Bengal to any great extent as it has been dealt with exhaustively in medical papers, journals and the lay press in connection with the most unfortunate famine that swept over Bengal. It is the duty of the Scientific Advisory Board to point out the poignant apathy and neglect of those who be in power in this respect. Strangely the autopsy study on starvation cases showed how useless it was to observe the effects of starvation when the subjects were not healthy specimens possibly in any time of their lives.

More energetic work should be done in the domain of pharmacology and therapeutics as our contributions are pitiably meagre in comparison to what is done in the West. We have always looked upon others as our saviours. The war gave the best opportunities for raising the standard of our pharmaceutical achievements particularly in the field of indigenous drugs. But I am afraid no striking success have been scored by us.

Progress has been made in hæmatology, dermatology and sundry other medical subjects in quite a satisfactory manner. Proposals for further research work are fairly tempting and we fondly expect that more practical utility will be derived not only by the medical men but also by the average civilian.

B. P. TRIBEDI.

INDIAN JOURNAL OF PEDIATRICS—Edited by Dr. K. C. CHAUDHURI. Tenth Anniversary Number. In two parts. Part I (January, 1944), Part II (April, 1944). Published by S. C. Sarkar & Sons, Ltd., 1-1|C, College Sq., Calcutta.

Since the inception of its career in October 1933, this journal has received the applause of the leaders of the profession, both in and outside India and has rendered a good service, to the cause of advancement of the practice and original research in pediatrics in this country. The volumes under review are in commemoration of its tenth anniversary. Among the principal contents, the papers of 'Study of Development of Indian Infants in a community in Calcutta', 'Cirrhosis of liver in infancy' and 'problem children problem parents' deserve special mention. Every reader will appreciate the reproduction of the record of discussions on penicillin, held in the Section of Experimental Medicine and Therapeutics of the Royal Society of Medicine. We wish the journal a long, useful and honourable career.

HIMANSU ROY.

CATECHISM SERIES—PHYSIOLOGY, PART I—Fifth Edition (Revised and Enlarged), pp. 82. Published by E. & S. Livingstone, 16 & 17 Teviot Place, Edinburgh. Price 1s. 6d. net.

The book in review is one of the wellknown Catechism Series of books on Medical Sciences. That it has passed through four other previous editions, speaks of its popularity amongst students for whom it is intended. A popular catechism like this is likely to be of considerable help to the students preparing for the imminent examinations but as the pargraphs are too concise and sketchy, the usual practice of the students to use it from the beginning as a substitute for text books must be discouraged. Although the chapters on Nerve-Muscle Physiology, Blood and Circulatory System and Autonomic Nervous System (including Vasomotor Nerves) have been dealt with in a coincise but lucid style, there are some conspicuous omissions, such as transmission of Nerve-impulse in the Motor and Sensory Nerves, as also through the Central Nervous System; Regulation of Coronary, Pulmonary, Porta, Renal and Cerebral circulation; Plasma-phoresis; Effects of Iron, Copper, Cobalt, Nickel, Thyroxine, Vitamin C and anti-anæmic principles on the regeneration of red blood corpuscles in their various stages, transfusion of plasma or serum as a substitute for that of blood etc. Moreover, there ought to have been a separate paragraph on Carotid Sinus, which is conspicuous by its absence. These should have been included in this revised and enlarged edition. Inspite of these omissions the book is pleasant-reading, embodying many valuable informations for the students as an aid to memory before the *viva voce* examinations. With a note of warning that they must not rely on the catechism series for learning the subject or preparing for the theoretical part of the examinations, I can unhesitatingly commend this volume to them.

R. K. Pal

CORRESPONDENCE

The Editor is not responsible for any views expressed by contributors.—EDITOR.

PENICILLIN

The Editor, *Journal of the I. M. A.*, Calcutta.

Sir,—I am writing to you after a long time to bring to your kind notice about certain advertisements containing penicillin products which has brought forth a caustic remark from the Inspector General of Civil Hospitals, Bihar, at the 4th Bihar Provincial Annual Conference held on 9th and 10th of December, 1944 at Bhagalpore. He brought a box of that product in the Conference and warned the doctors not to use it saying that "it does not contain anything like penicillin and also contains unsterile liquids." He is of opinion that such a bogus thing must not be advertised in a paper like the *Journal of the Indian Medical Association*. I am writing this only for your information. You should take steps in the matter.

Salempore, Saran, Yours etc.,
24-12-44. K. L. SAHA, CAPT., M.B.

PENICILLIN

The Editor, *Journal of the I. M. A.*, Calcutta.

Sir,—I was an interested reader of the correspondence column of the December issue of the Journal and I herewith hasten to endorse Dr. Chowdhuri's question about Messrs. Deodhar Brothers.

Your reply thereto that you do not guarantee the potency or effectiveness of the medicines advertised is not complete. This is legally true but not ethically. We expect you to refuse to publish a statement which you know to be wrong. I hope you would not accept for publication that sodi bicarb will cure a case of syphilis in five days, then why do you not want to use the same discretion in your advertisement column. It is because you fear that the income from that source will be lost to you. Here I would like to point out that we the members of the Association will not want our Journal to be lowered in the eyes of the profession as a whole. You owe us something and the honour, self respect and spirit of righteousness has got to be maintained.

I had many occasions to compare the advertisement columns of our Journal, the *Indian Medical Journal* and the *Indian Medical Gazette* and contrast is apparent. The policy of the Gazette in this respect was made crystal clear sometime back by Dr. John Lowe of the Gazette. He has got his master to please and any advertisement refused is a direct loss but it did not stand in the way of the Editor. You have no such obligation. It was a real pain to me when the advertisement refused by that Journal (about sulphanilamide therapy—introduced by a firm of Calcutta) was continuously printed in the *Journal of I.M.A.*

To end I would like to add that the advertisement income of the Gazette is definitely more, while every body knows that the Journal has a wide circulation and gives a better publicity and matters should be different.

I would request you to publish my letter and print the reprints from Dr. Lowe's notes, and thus put the subject before the profession for their verdict.

Gorakhpur, Jubbulpore. Yours etc.,
20-12-44. B. M. NATH, L.M.P., L.T.M., D.T.M.

[We are publishing the above letters with pleasure. We are glad to see that the profession is taking a keen interest in the problem of purity, potency and effectiveness of drugs. The Journal has been fighting for these for a long time. We draw the attention of our readers to pages, 324, 338, 362, 383, and 542 of volume IX (1939-1940) showing the efforts of the Indian Medical Association during the enactment of Drugs Act of 1940. We also ask them to read the illuminating speeches of Dr. R. D. Dalal and Pandit Laksmi Kanta Maitra during the Drugs Bill Debate published in the same volume pages 516 and 527 respectively. The question is far wider and far reaching than what our correspondents think. In the absence of a Drugs Standardisation Laboratory or a Therapeutic Trials Committee, at the disposal of the Association, we can not scientifically evaluate the claims of drugs. The American Medical Association has the "Council of Pharmacy and Chemistry" which brings before the profession the truth regarding old and new medicines or proprietary preparations. In England the "Therapeutic Trial Committee" under the Medical Research Council has an almost similar function. Every body is aware of the huge quantity of adulterated, understrength, and faked drugs which are being sold with the most exaggerated and fantastic claims. There is no law to prevent the publication of those nostrums such as cure of cancer, tuberculosis, rejuvenators, comouflaged abortifacients to gullible public even in the daily press. There is not only a huge financial loss and self medication of the public, but all these may mean a question between life and death, *e.g.*, faked quinine ampoule in a case of malignant malaria, or an understrength antidiphtheritic serum in a case of diphtheria. In our country, efforts to control this drug scandal, started in 1930, with a Drug Enquiry Committee with Prof. Chopra as its Chairman. This Committee recommended (*i*) the enactment of an All-India Drug Legislation and (*ii*) the establishment of a machinery for the testing, checking and standardisation of drugs. A Drugs Act was introduced in 1940 and a control order was framed in 1944 but the Act has not yet been fully enforced. The Drug Control order is concerned only with price of drugs and does not guarantee the purity and strength of the drugs sold to the public. Chopra and Mukerji in their extensive survey of the quality of drugs in India between the year 1937-1940 found that as many as 49 per cent of the drugs ordinarily available from the open market, of both Indian and European origin, did not agree with the standard specifications or with the claims made on the label of the containers (See Presidential address by Dr. B. Mukerji, 32nd Indian Science Congress, 1945 at Nagpur on Section of Physiology). In 1937, the Government of India published a scheme for Drugs Control Laboratory, to protect the public against misbranded or adulterated drugs and honest producers against unfair and enforced competition. But uptil now no such Laboratory is functioning. It is the primary obligation on the part of the Government, a function accepted by all modern Governments, to see that pure and standardised drugs are available to the suffering public.

In England penicillin has now been brought under the Therapeutic Substances Act. Now the control will be on three preparations—penicillin (crude filtrate), penicillin (dried crude filtrate) and purified penicillin in the form of a salt, *e.g.*, penicillin (sodium salt). "Any firm wanting to make penicillin for sale must apply in the usual way to the licensing authority, which first satisfied itself that premises, plant, processes and staff are adequate and satisfactory for the proper manufacture and testing of the substance. Then the products offered for sale must conform to standards and tests laid down in the new Seventh Schedule or in the general regulations"

(*Continued at foot of page 110, col. 2*)